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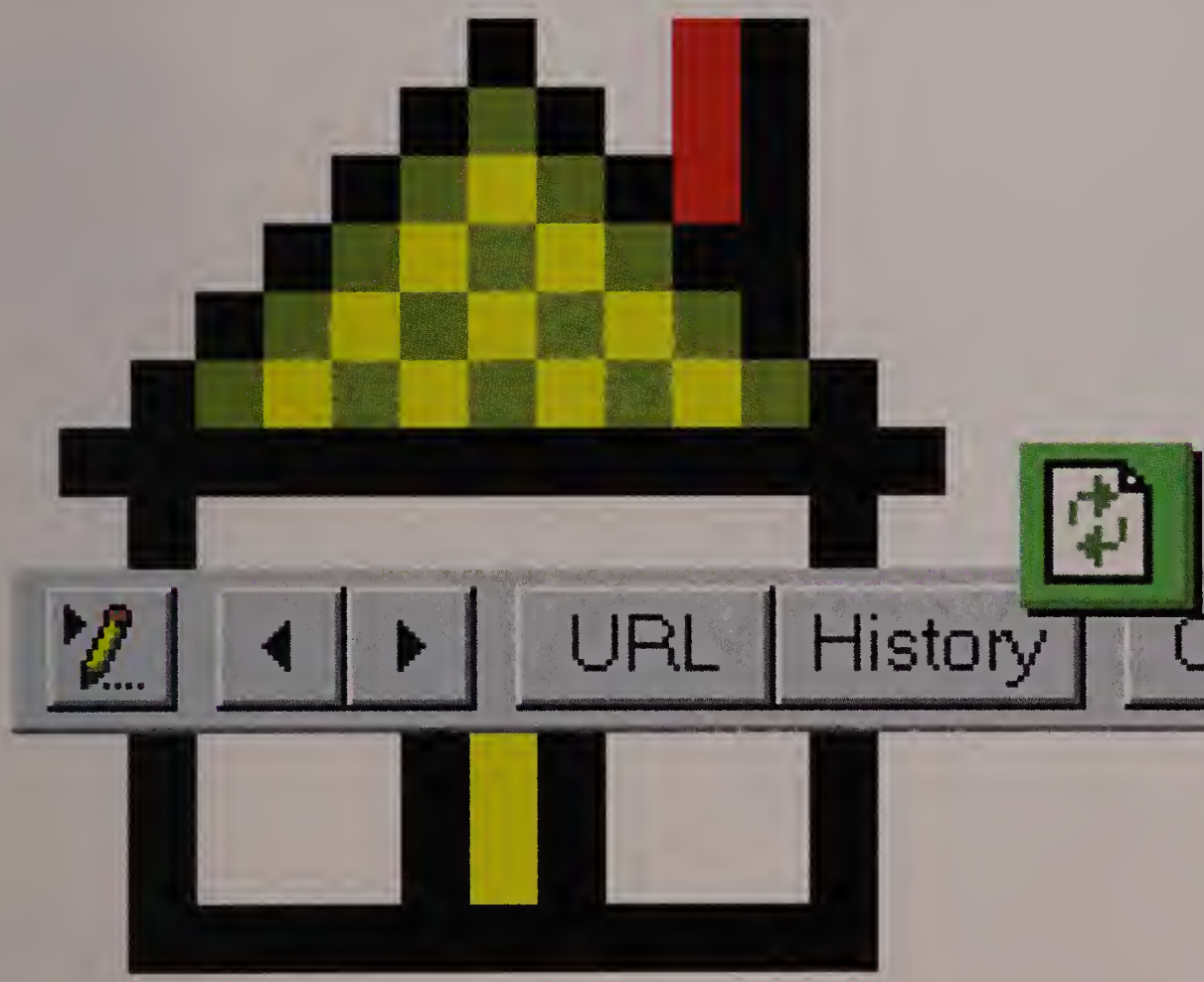

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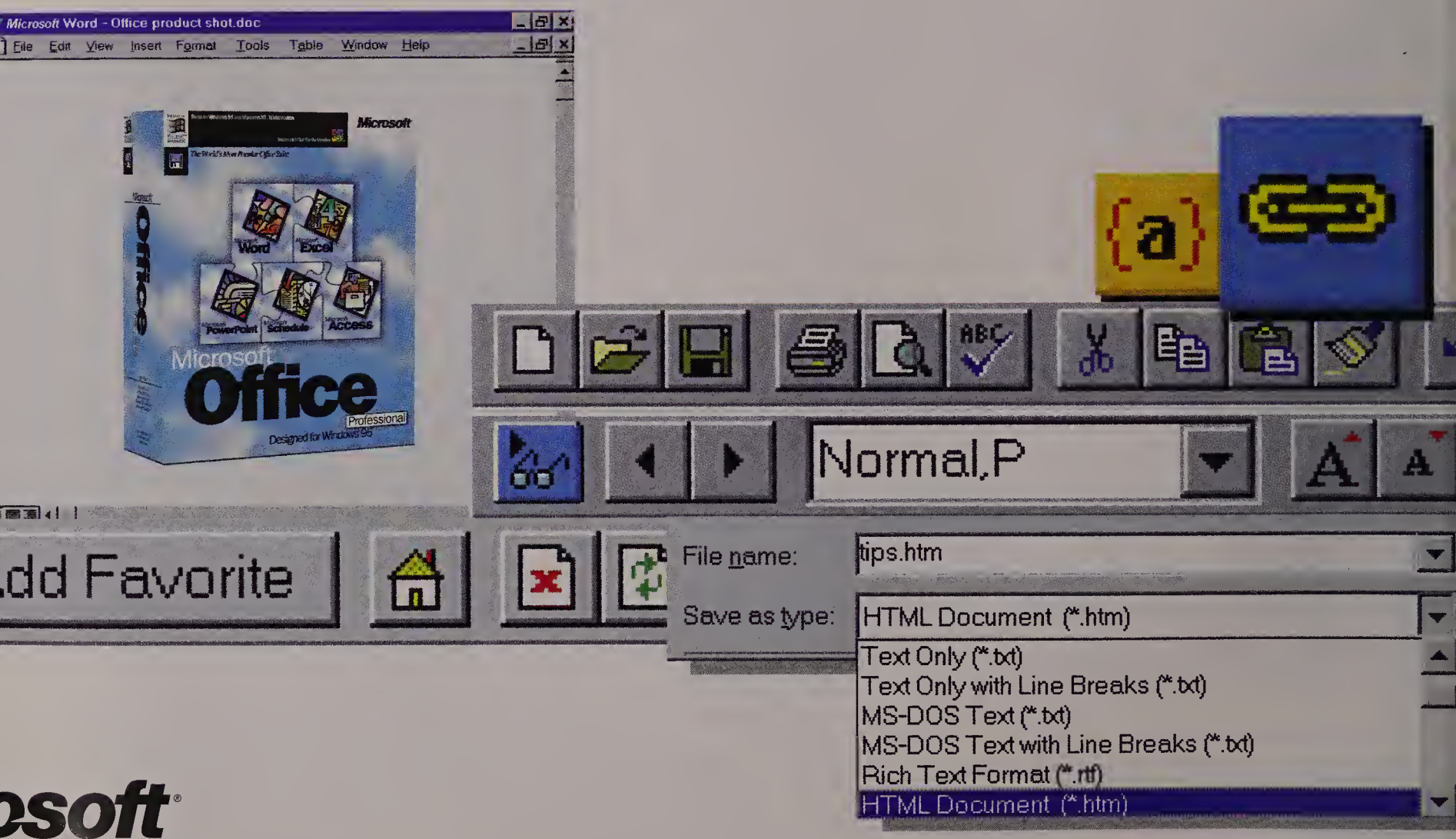

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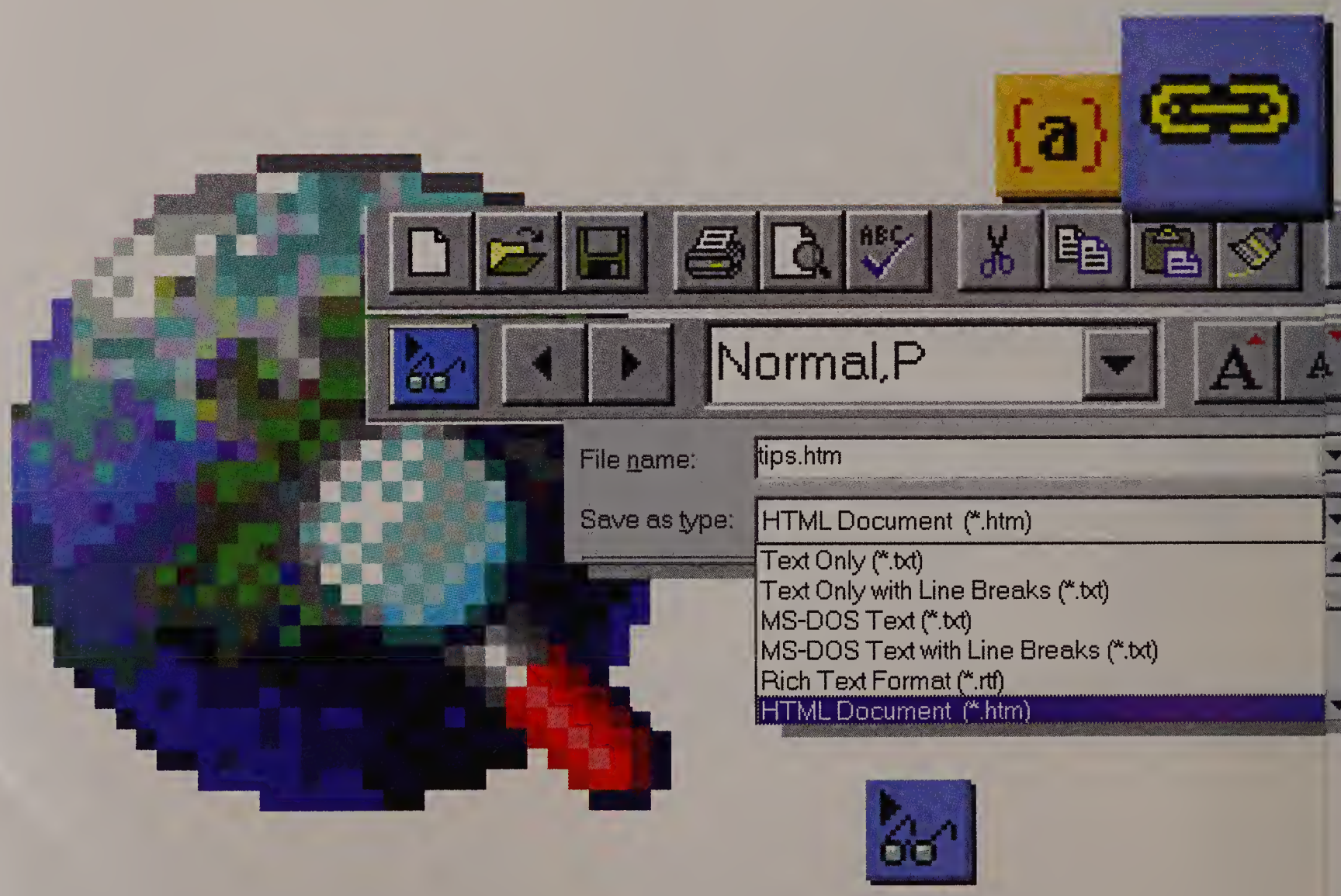

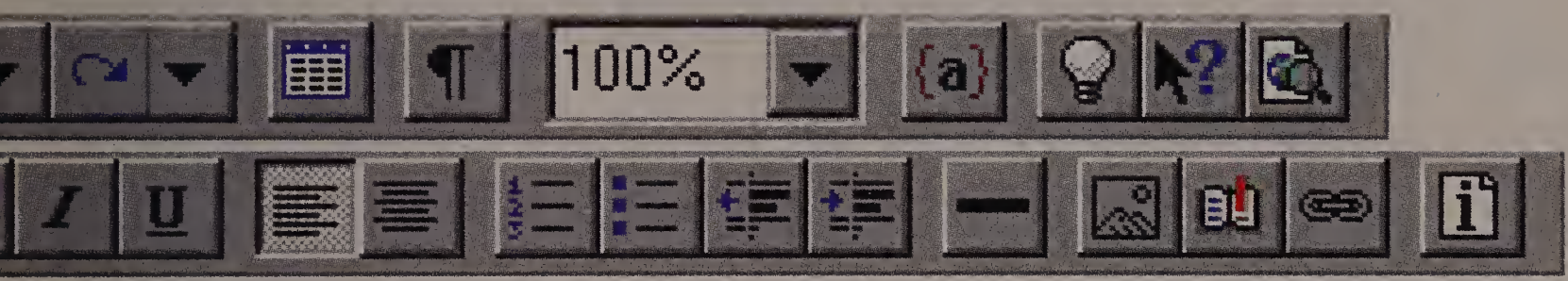
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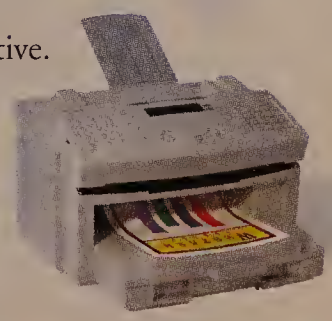

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NOVEMBER

VOLUME 14 ◆ NUMBER 11 ◆ MULTIMEDIA EDITION

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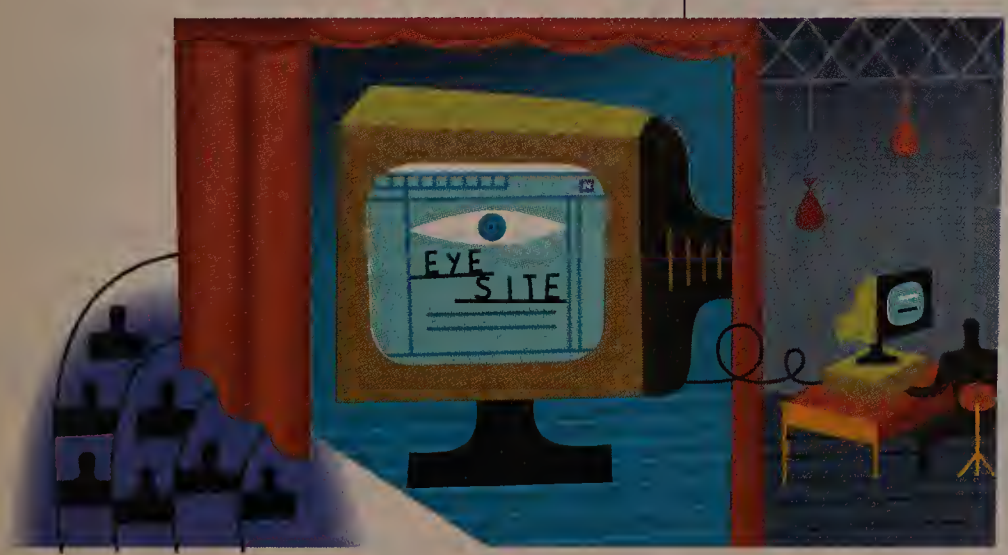

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CONSUMER ALERT Reveal, once the leader in low-end multimedia peripherals, has fallen on hard times, leaving customers without support and buyers waiting months for product rebates. Now consumers may have to get in line behind creditors.

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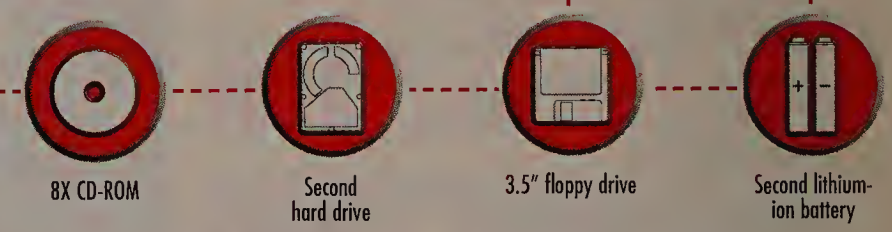

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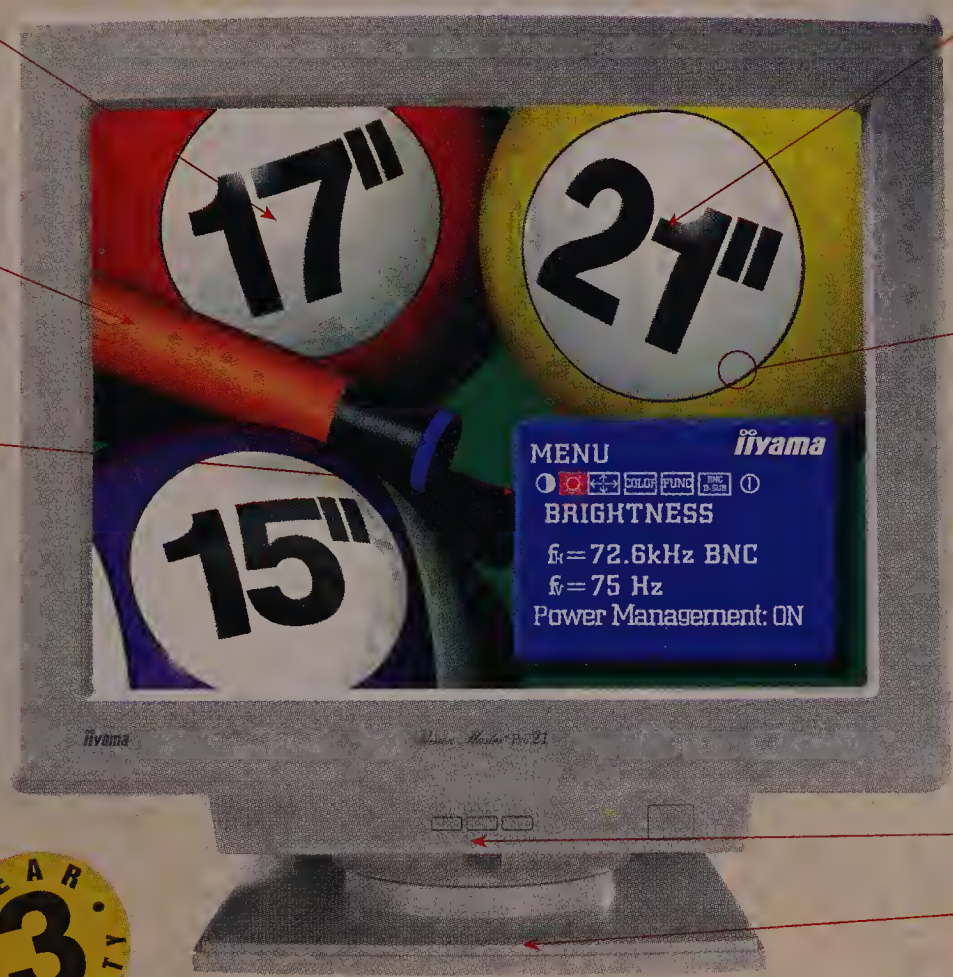

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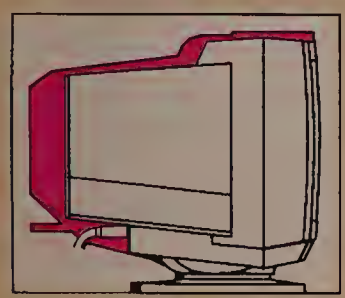

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Upgrades That Make a Difference

AT A RECENT CONFERENCE on Internet and multimedia applications, an Intel spokesperson drew a dramatic analogy to illustrate the rate at which PC technology has evolved since its inception. If cars had improved at the same rate as PCs, he said, they'd now get half a million miles to the gallon, and it would be cheaper to buy a new car than to park the old one.

Granted, it's in Intel's best interest to emphasize great strides in PC performance. But no other consumer product consistently shows more stunning performance gains, adds more capabilities and functions, and yet costs less from year to year than PCs.

Who could possibly complain about this state of affairs? Only the millions of businesses and consumers who bought a PC six months, a year, or two years ago and now see prices $500, $1000, or even $1500 less than what they originally paid.

If you are one of these people, grousing about how much you could have saved if you had only postponed your purchase, chances are that before you buy your next computer, you will upgrade your current system to make it last as long as possible. This month's cover story, "Upgrades: The Best for the Buck," will tell you whether an upgrade makes sense for your particular computer and, if so, which upgrades are the best deals.

Adding the **right amount** of RAM and a **faster processor** can speed a PC up to **48 percent**—for a fraction of the cost of a new system.

IF YOU UPGRADE, CAN YOU TELL?

FOR THIS YEAR'S annual upgrade story, *PC World* editors and Test Center staff took "vintage" 486-66, Pentium-75, and Pentium-100 PCs, beefed up RAM to 16MB and 32MB, and installed a variety of processor upgrades. The results of their tests show that in many cases the best upgrade is the simplest and cheapest: more RAM. But in some cases, adding the right amount of RAM and a faster processor can boost the performance of your PC by up to 48 percent—for a fraction of the cost of a new system.

In a twist on the usual performance tests, our staff went a step further and invited typical PC users into the lab to see if and when they could actually perceive performance differences on Pentium-75 PCs, pre- and postupgrade. The results: Half the testers did *not* notice a performance increase of 11 percent on the upgraded PC. Our advice: If an upgrade will bring you only a marginal improvement in performance, save your money. You're better off putting the several hundred dollars toward the purchase of your next PC.

FASTER ACCESS TO THE NET

ALTHOUGH THE RIGHT upgrades can make a significant difference in your PC's performance, they'll do little to alleviate the tedium most of us have come to expect when connecting to the Web, online services, or an office network. If you're currently using a PC with a 9.6-kilobits-per-second or 14.4-kbps modem, upgrading to a 28.8-kbps modem can cut the time you'll spend downloading files in half. This month we tested 14 leading internal 28.8-kbps modems, including three that also support the higher throughput rate of 33.6 kbps. Our tests here turned up some surprises: The fastest 33.6-kbps modem was still slower than six of the 28.8-kbps models, and only one 33.6-kbps modem qualified for our Top 10 chart. Read "Fast and Cheap: Top Modems for Tight Budgets" for recommendations about specific models.

Our tests also revealed huge differences in how easy it is to get particular modems installed and running properly. If you think that Plug and Play certification guarantees quick installation, think again. Only three of the seven Plug and Play modems we tested—from Motorola and Hayes—installed easily. With some so-called Plug and Play modems, our editors had to go through such old-fashioned installation hassles as assigning COM ports and IRQs, upgrading BIOSes, and manually configuring the modems in Windows, sometimes to no avail. That's not to say that *legacy*—or non–Plug and Play—modems were necessarily easier, but it's one more reminder that specs alone don't tell the whole story.

AN AUDIBLE DIFFERENCE

TO HEAR THE DIFFERENCE an upgrade can make, consider a new pair of speakers. For "Sound Advice: The Best Speakers for $200 or Less," our editors hooked up ten speaker systems in succession to a Gateway multimedia PC, loaded a mix of games and audio CDs, and listened. The best sound came from some of the more expensive three-piece systems with separate subwoofers for producing big bass effects. But even with speakers that cost as little as $99, you'll get improvements that will please you as much as—if not more than—another 8MB of RAM.

Cathryn Baskin is editor in chief of PC World. ■

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Laptop Buyer's Guide May 1996, WinBook XP5 P120 16/1.3GB TFT

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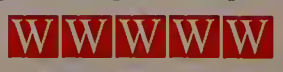

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September 1996 Windows Recommended WinBook XP5/P120

April 1996 WinBook XP5 P120 16/1.3GB Active Matrix

Laptop Buyer's Guide July 1995 WinBook XP OX4100 Active Matrix

January 1995 PC Laptop Most Improved WinBook XP

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August 1994 PC Magazine Editors' Choice WinBook XP OX250

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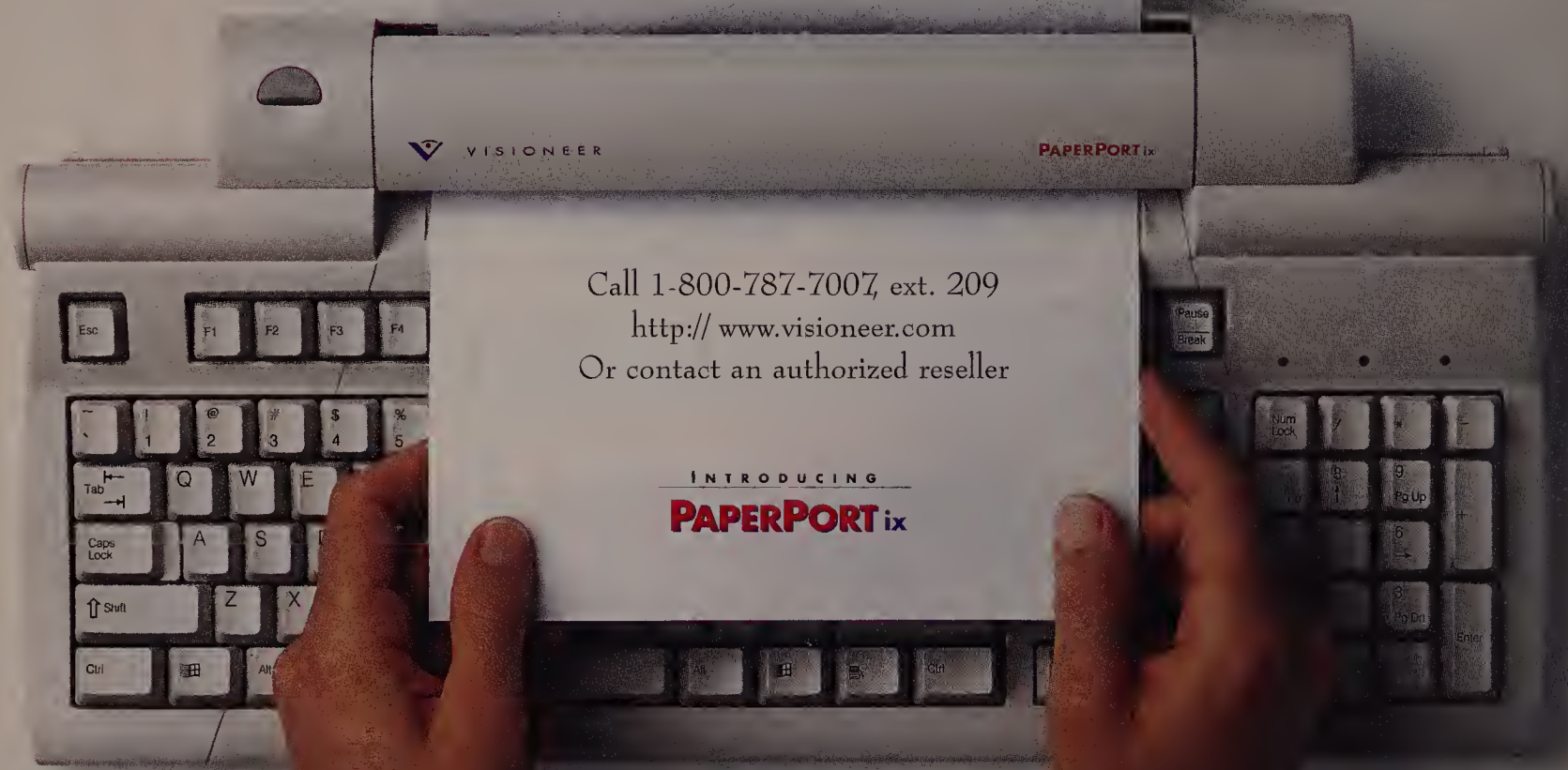

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YOUR TAKE ON: Cyrix versus Intel ◆ Software registration ◆ Editorial objectivity

CYRIX FASTEST–BUT BEST?

YES, THE CYRIX 6x86-P200+ may be faster than the Pentium ["Cyrix P-200+ PCs Beat Intel's Best Pentiums," *Top of the News,* September], but the problem is, the dustbins of technology are full of superior products. Most of them gained their edge by moving outside the mainstream at a cost in compatibility. So, yes, the P200+ runs Windows today, but how do I know that Microsoft won't tweak its operating system in favor of Intel tomorrow?

George A. Kirkman, Internet

"CYRIX P-200+ PCS Beat Intel's Best Pentiums" hardly seems fair to Intel. You imply that while Intel has simply increased the megahertz of its processors, Cyrix has created a new architecture for its latest chips, citing its use of out-of-order completion to boost processing efficiency.

This may all be true, but you have to remember that you're comparing Cyrix's 686 with Intel's 586. While Intel has been increasing its processor's clock speeds in its Pentium line, it has also been developing the Pentium Pro, which is a whole new architecture and does make use of out-of-order completion. Pentium Pro prices have dropped to the point where you can get a nicely equipped system for under $3000, and frankly, in the long run the Pentium Pro will have Cyrix beat as 32-bit software becomes commonplace. No doubt, Cyrix has created an impressive product, but I hardly think it's time to say that the torch has been passed to Cyrix.

Allan C. Tong, Odenton, Maryland

BLOW THE WHISTLE ON SOFTWARE REGISTRATION

HOORAY FOR YOU, Stephen Manes! *Full Disclosure* [September] brings up an issue that I have always felt is indicative of the arrogance and lack of consideration so rampant on the business scene today. It is about time someone blew the whistle on software registration and the entire concept of intruding on people's privacy. We are expected to spill our guts and tell all to everyone: the banker, the market research firm, the government, the employer, the merchant, and now the software manufacturer. Many, perhaps most, of us still value confidentiality. Thanks for pointing it out.

Janice D. Ochoa, Woodinville, Washington

NOT AN EASY UPGRADE

AS A LONGTIME user of WordPerfect, I think it's great that the product still has a shot at unseating Microsoft Word ["Software Suites: Corel Takes on Microsoft and Lotus," September]. However, it does dismay us WordPerfect devotees that Corel is not offering a simple upgrade from the Windows 3.1–compatible version 6.1 to the 32-bit Windows 95 version 7.0. The current $99 package includes two other Corel products that I have no use for. Corel customer service has vaguely promised a fall release of a WordPerfect-only upgrade. This does not seem to reflect much appreciation for those of us who have hung with WordPerfect all these years.

Scott Cox, Internet

LOCAL DEALERS OVERLOOKED

REGARDING "Bargain Hunter's Guide to Buying PCs" (September), an unmentioned source of inexpensive, high-quality PCs is local dealers who sell no-name clones. My experience with them has been outstanding; over the course of ten or so years I've bought many computers from these small storefront shops and have yet to be disappointed.

I do my homework, I know what I want, and I choose stores that I believe will be around for a few years. What I've found is people who treat you fairly, are knowledgeable about what they sell, and provide excellent, inexpensive service, all for a price that is equal to or less than the name-brand mail-order people, and usually cheaper than the discount chains as well. I know it's impossible for a magazine to cover all these stores. But I'm disappointed when I read an article about shopping for computers and find that the local folks are not even mentioned.

Joe Didier, Baton Rouge, Louisiana

MISSING MONITORS

WHAT HAPPENED TO your stated mandate to provide "ongoing" comparisons of monitors, comparing new models to ones tested in recent months?

I realize you've changed your testing methodology somewhat, but why didn't you retest the earlier models using the new criteria? Not a single one of the Top 10 17-inch Monitors from your July issue was included in the 25 reviewed this month. I find it hard to believe that none of July's Top 10 would have been in September's chart. What's going on here?

Ken Liang, Toronto, Ontario

Editor's response: Vendors incorrectly informed *PC World* that two of the monitors, the Iiyama VisionMaster Pro 17 and the Princeton Graphic Ultra 17+, would be discontinued. We will retest them for our January review. The other monitors from July's chart were being upgraded at the deadline for our September roundup and could not be tested. Unfortunately, this information was cut from the article. We'll test these upgraded models as soon as they become available. –John Goddard

PC WORLD'S NEW FACE

CONGRATULATIONS! As an avid reader of PC-related publications, I want to give you a piece of my mind. Your new layout and expansion of key features is great. Although I normally read each issue cover to cover, I find that the new layout makes me even more efficient, letting me put major pieces of the content into an order that fits my personal mental database.

Ed Halley, America Online ▶

ILLUSTRATION: WARD SCHUMAKER

YOU HAVE ALL put a lot of time and thought into the redesign of *PC World*. As a regular reader of your magazine, I'm sorry to say it doesn't work. Here's why: Sections that were important had been close to the front of the book and each had its own clearly defined space. Now all the important stuff is hidden. It took me 15 minutes to find the *Hardware* column, and I knew what I was looking for!

We all have sections we turn to first—time is always a premium—and when we can't find what we want, we tend to put the magazine aside. With the old magazine I frequently gleaned tidbits on the way to where I wanted to go. Now it is confusing and time-wasting.

Mario Suriani, Internet

UP FRONT ABOUT OBJECTIVITY

I ALMOST FELL OUT of my chair when I read Cathryn Baskin's statement "Though the suspicion of *PC World*'s editorial collusion with advertisers is unfounded, it calls for action" [*Up Front*, September]. I thought that maybe several editors had been rounded up and made to walk the plank for objectivity violations.

I do not think that a steady reader of *PC World* would believe that editorial objectivity was in jeopardy at any time. I have always found your magazine to be forthright and fair. All one has to do is scan through your product reviews and notice some products from big-name advertisers getting a thumbs-down. I am afraid that you are being unfairly grouped with some of your competitors. Please rest assured that current readers are well aware of your honesty and proconsumer slant. Most of us are current readers because of it.

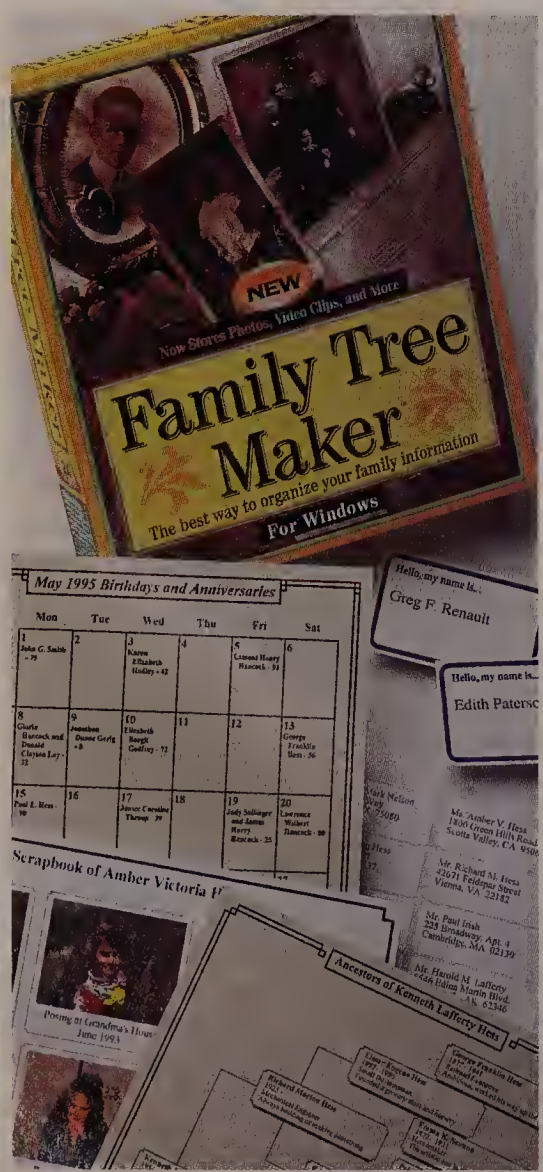
Eric J. Smith, Slingerlands, New York

CATHRYN BASKIN STATES the staff's surprise at readers' suspicion about editorial collusion with advertisers. As a reader, I am not surprised that you were surprised. In the face of facts, it is hard for me to believe that you have much respect for the knowledge that your readers have about the computer industry and its products. A case in point: Packard Bell, which does not advertise in any of the computer magazines I read, rarely is included in your ratings, and when it is, it does not show very favorably. Yet the products it produces account for 44 percent of the U.S. market. It was number one in retail sales, number two in all U.S. shipments of PCs, and number four in the world in 1995.

Are all of us who buy these products that far off base? I don't think so.

Edward J. Spuler II, Lowell, Massachusetts

Editor's response: We last reviewed Packard Bell computers for our June Top 20 PCs review. Our evaluation cited two major problems: bad performance and abysmal service. Neither problem is new. In fact, since we began our monthly survey of PC reliability and service almost three years ago, readers have consistently rated Packard Bell's service among the worst of all PC com- ▶



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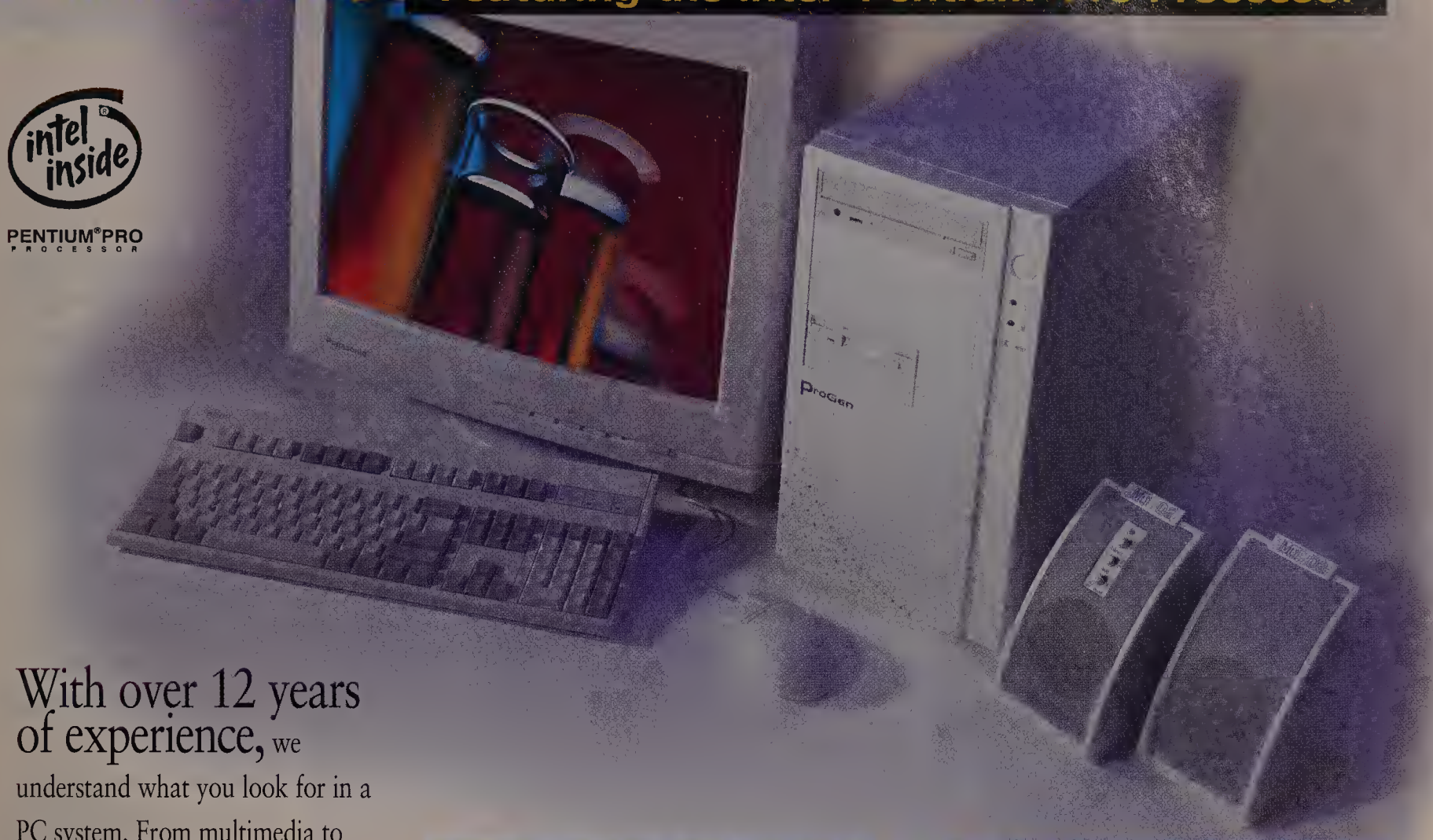

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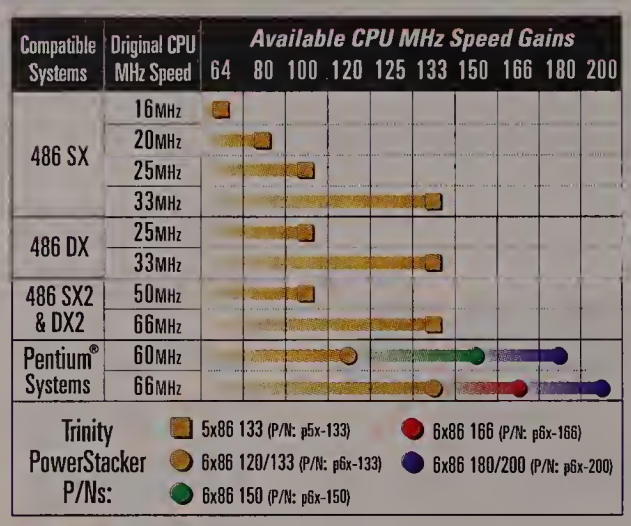

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PC WORLD

panies. Regardless of the number of PCs Packard Bell sells or whether the company chooses to advertise in *PC World*, we cannot recommend these systems to readers. However, we'll continue to review Packard Bell systems in upcoming issues. **–Cathryn Baskin**

UPLOAD TO FTP SITES

IN "BEST WEB BROWSER" (August) you say that Internet Explorer and Netscape Navigator are not able to upload to FTP sites because they support only anonymous FTP. Here's a tip that works with Netscape Navigator 2.*x* and higher: When you want to upload to your own FTP site, type in your user ID, password, and domain as in the following URL: **ftp://*userid:password@domain*** (for example, **ftp://jmendez:mypassword@pcworld.com**).

Jesse Mendelsohn, Internet

PC World *welcomes your responses, ideas, and other letters to the editor.* *See page 12 for contact information.* ■

CORRECTIONS AND CLARIFICATIONS

In October's *Bugs and Fixes*, we referred to a bug in some U.S. Robotics Sportster V.34 modems. As we reported, U.S. Robotics has stated that it will replace modems for customers who encounter the problem and request an exchange. We referred to the exchange program as a recall. However, U.S. Robotics (847/982-5151) has asked us to make clear that it is not asking customers to return all affected modems and does not consider its offer to exchange modems a recall.

In "Bargain Hunter's Guide to Buying PCs" (September), an incorrect phone number was printed for Micro Exchange. The number is 800/284-9296.

The Web address for the U.S. Robotics WinModem 33.6 upgrade patch (*Bugs and Fixes*, September) has changed; it's now http://www.usr.com/home/online/files/dl07.htm.

September's *Quick Takes* review of Okidata's Okipage 4w printer should have stated that the device is an LED printer, rather than an ink jet printer.

The price for the IBM PC 350 P200 was listed incorrectly in September's Top 20 Power Desktops. It should have read $4122.

PC World regrets the errors.

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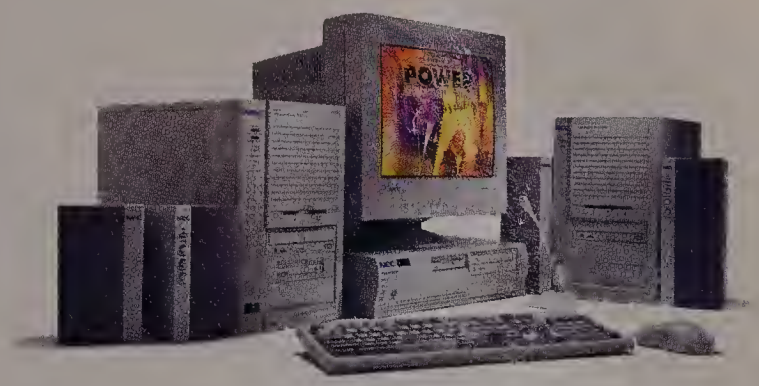

The next time there's a five-alarm fire at the office, sit back and relax. With the new PowerMate® Series from NEC, you can manage the entire network without leaving your desk.

The fact is, exclusive NEC MagicEye™ technology monitors the function and operation of each PowerMate system, including its hard drive activity, temperature and voltage. It'll even alert you if a computer is tampered with. If a problem is detected, Intel's LANDesk® Client Manager 3.0 lets you remotely access the system for efficient, centralized management. What's more, Cybermedia's FirstAid 95 Deluxe automatically fixes configuration errors and, along with McAfee's anti-virus software, protects your valuable data.

Alone, the PowerMate desktop computer can be anything from a general office PC to a powerful corporate workstation. Linked together, they're a sophisticated network that you can remotely manage.

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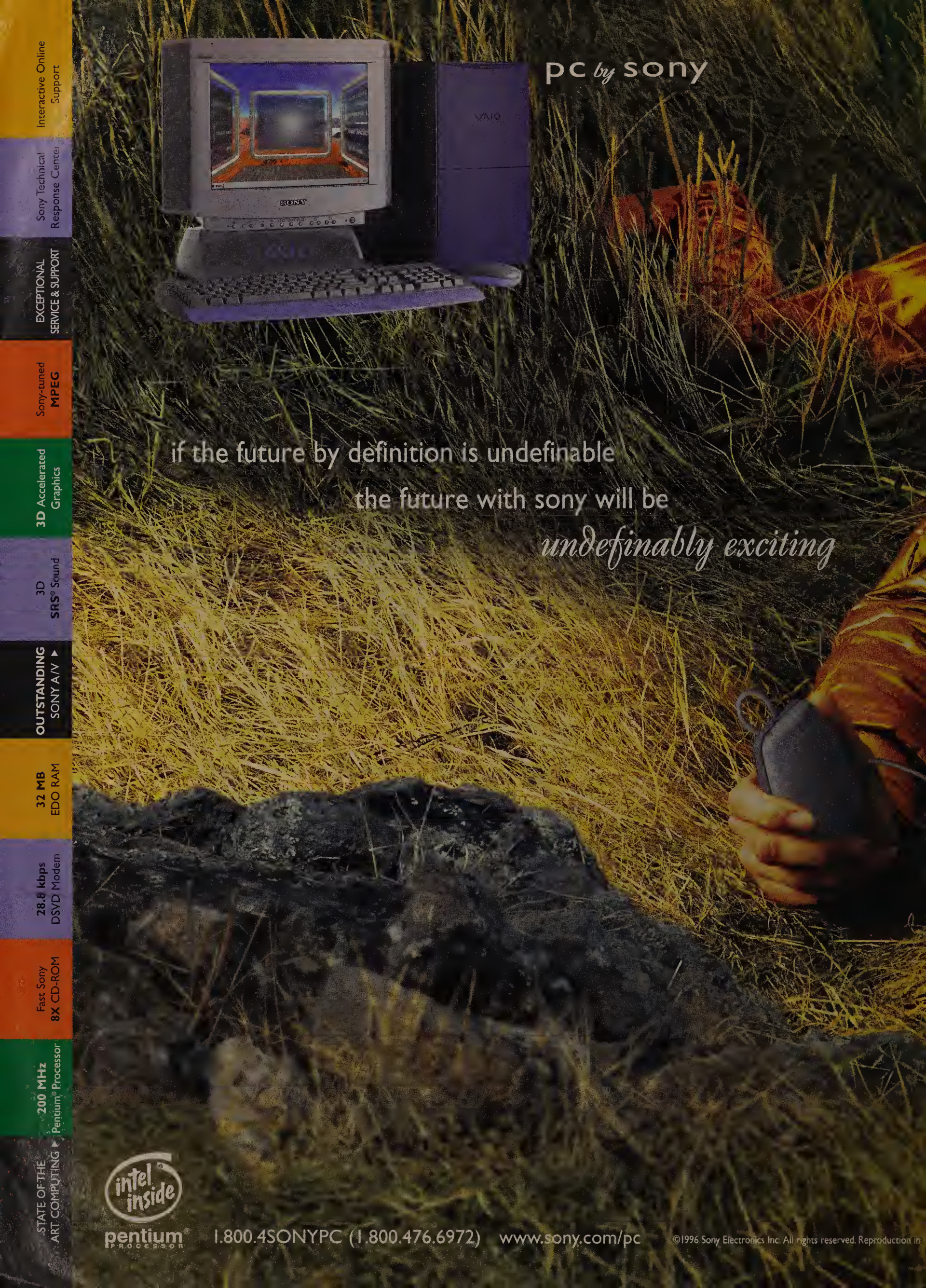
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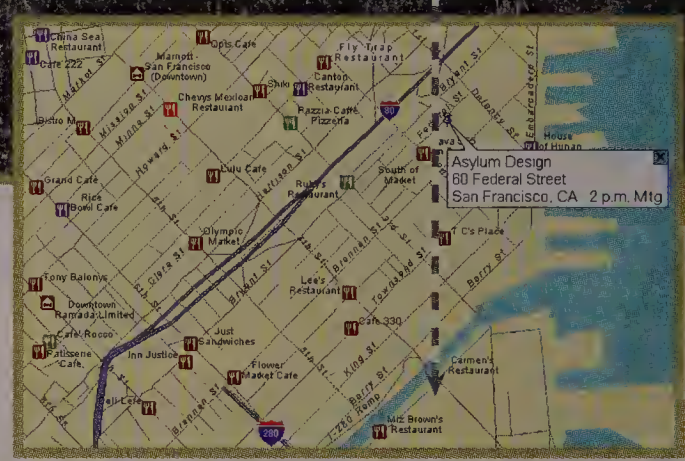
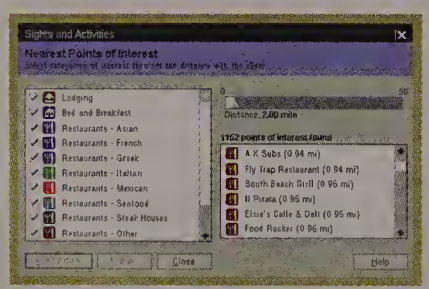


I'm 1.4 miles away from a tantalizing corned beef sandwich at the Fly Trap Restaurant, 15 minutes from just the right bed at Anna's Three Bears, and 1.3 miles away from shaking on a deal at Asylum Design.

When faced with the realization of being hopelessly lost, most members of the human race will staunchly resort to denial. Happily, Microsoft® Automap® Streets Plus - Deluxe Edition is about to eliminate the problem of losing one's bearings.



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An Escape From Tech Support Hell?

Automated software diagnostic tools may save you from long waits for help.

ILLUSTRATION: HUNGRY DOG STUDIO

HAVE YOU CALLED A hardware or software company's technical support line lately? I have, and you know what? They really don't want to talk. Sure, everyone offers telephone support, but they don't seem to want customers to use it.

Just about every company—from the biggest fish down to the very smallest guppy in the personal computer industry pond—is busy practicing "call avoidance." That's mumbo jumbo for "do whatever it takes to keep the customer from calling in and talking to customer support."

You see, although hardware and software companies have developed phone-based support, not many have an effective system in place to field all the incoming calls. The results? Exorbitant support costs for hardware and software companies, and ridiculously long hold times for customers. It doesn't take a rocket scientist to figure out that's a formula for disaster.

Customer satisfaction with software support is at a ten-year low, according to Bill Rose, executive director of the Software Support Professionals Association, an industry group based in San Diego. And no wonder: 85 percent of the calls made to PC hardware and software companies during peak hours encountered busy signals, notes Dataquest, a market research firm in Westborough, Massachusetts. And *PC World*'s Reliability and Service Survey, a monthly questionnaire, finds that it takes consumers just over 30 hours, on average, to speak with a technical support representative who can resolve their problem.

With the phone lines jammed, more and more customers are turning to online support options, logging on to company Web sites and company-sponsored message boards on commercial online services. Customers looking for assistance post thousands of messages every day—and frequently bemoan the poor response they get. Even companies that were pros at customer service are getting battered. Last year, for example, both Compaq and Intuit—two leaders in support in the consumer market—faced a hailstorm of criticism from customers angry about long hold times and unsatisfactory electronic tech support alternatives.

The problem, says Tom Sweeny, Dataquest's director of software services, is this: While nearly every company is directing customers to its online support services, few know how to process the flood of electronic queries efficiently. "These are phone-centric organizations," says Sweeny, noting that most companies have yet to integrate and route electronic queries as quickly as they respond to questions over the phone. "Unlike with their phone services, companies won't commit to a turnaround time for electronic submissions," says Sweeny. "They still haven't figured out the staffing issues."

Jim Wilmott, product support manager for Broderbund, can attest to the difficulties of managing an online support operation. Broderbund has been aggressively promoting its Web-based support, where the company's ▶

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knowledge base—a database of solutions to previously reported problems—is available for customers who feel comfortable trying to diagnose and troubleshoot their own problems. Customers love the tools, but Broderbund is still grappling with ways to respond to the inevitable queries that it receives electronically. "We need an elegant solution, and we really don't have one," says Wilmott. His team shoots for a 24-hour turnaround on e-mail questions, but it does not always achieve that goal.

And Broderbund is not alone. "*No one* will commit to a turnaround time for electronic submissions," says Sweeny.

Two new technologies, expected to be available to consumers this fall, may resolve some of the difficulties consumers and PC companies face. Both rely on software diagnostic tools to help identify the cause of problems, and—in theory—expedite their resolution.

AUTOMATIC HELP?

THE FIRST OF THESE TOOLS is a software program called e.support from TouchStone Software and the Software Support Professionals Association. It's designed to provide consumers with a single interface for contacting hardware and software companies for e-mail–based support. TouchStone expects the consumer software to be bundled with new and existing hardware and software products or downloaded from the e.support Web site (http://www.esupport.com).

The e.support package includes two components: a sophisticated forms-based program that walks users through a series of questions about the problem they're having with their hardware or software, and a copy of WinCheckIt, TouchStone's Windows 95 diagnostic software. After users complete a problem report, they are prompted to run WinCheckIt, which produces a detailed profile of their PC. Once those two files are complete, the entire document gets e-mailed to the consumer's hardware or software company.

The concept is promising, but some bugs must still be worked out. The forms approach to e-mail queries is a great idea, since it prompts customers to provide technical support with the kind of information it needs to begin diagnosing a problem. But the program is most effective when combined with the accompanying diagnostic report. Unfortunately, WinCheckIt did not get high marks as a diagnostic tool when *PC World* last reviewed it ("Complete Guide to Windows Utilities," June).

> Right now **one e-mail message** can generate **four to five exchanges** between tech support and the customer.

There's another catch: The complete WinCheckIt report goes only to those companies that subscribe to TouchStone Software's service. According to Carolyn Gross, product line manager for TouchStone, several major hardware and software companies have expressed interest in the program, but at press time the company hadn't announced its list of initial subscribers.

Vendors that don't subscribe will still be forwarded e-mail detailing your problem, but they'll get a truncated version of the diagnostic report. More important, perhaps, the nonsubscribers won't be as enthusiastic about the program and may be less likely to promote its use or devote sufficient staffing to respond quickly to e.support mail.

Broderbund's Wilmott, who's considering adopting e.support for his company, says it could help tech support respond to the growing number of e-mail messages his company receives every day. Right now, says Wilmott, one e-mail message can generate four to five exchanges between tech support and the customer. "With e.support, in one fell swoop, the techs would have all the info they needed to solve the problem. If it can do that, it's a valuable tool."

HOPE FOR HARDWARE HASSLES

WHEREAS E.SUPPORT will be bundled with both hardware and software products, SystemWizard will be bundled first with PCs. The software, from System- ▶

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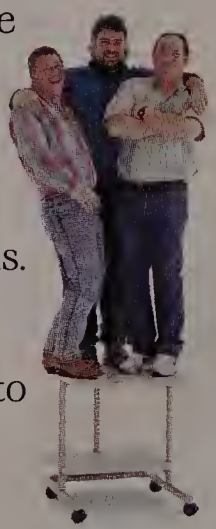

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Soft in Natick, Massachusetts, is designed to help home and business users resolve common hardware and software conflicts. It includes elaborate diagnostic tools that can either be launched by the consumer, much like any other Windows application, or be set to start automatically when a problem occurs (such as a General Protection Fault in Windows).

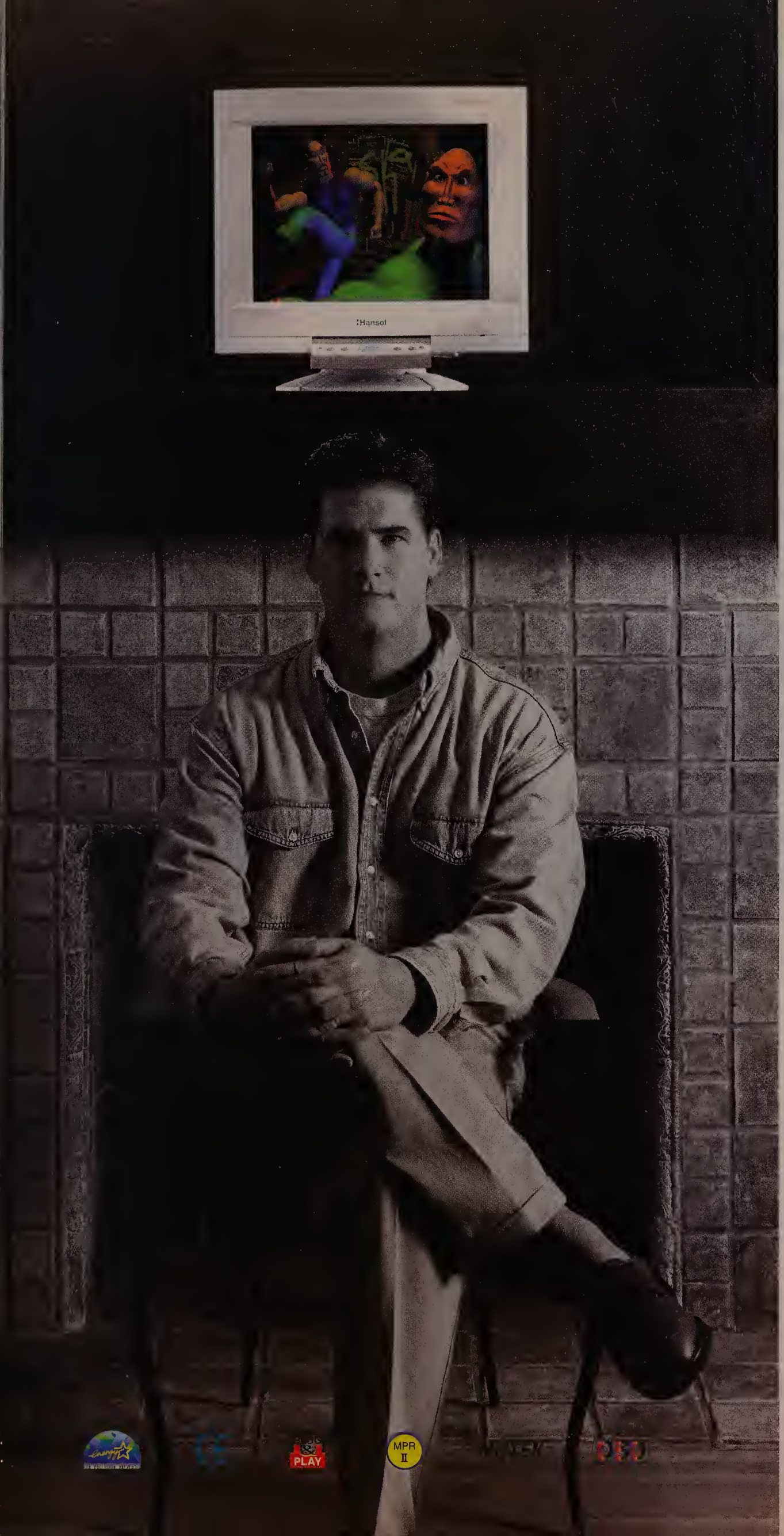
The software will troubleshoot problems the moment they occur. Using a knowledge base customized for a specific model and brand of PC, the software will either identify and correct the problem, or dial in to the particular PC company's own knowledge base on the Internet, which could contain more detailed or more recent information. The database that resides on the consumer's PC will be updated each time a new problem is identified and corrected.

AST will offer SystemWizard on its home PCs later this fall. Digital Equipment, which, along with Intel, helped to develop the software, will be offering SystemWizard on its business-class systems at about the same time.

SystemWizard is designed to detect and fix multimedia configuration hassles, outdated printer drivers' conflicts with modems and communications software, and other problems. If the expert system isn't able to solve the difficulty, the call is transferred to the company's technical support phone line, where a live technician is assigned the task of resolving the problem then and there.

Will either of these programs answer all your tech support problems? Of course not. But early looks at both indicate they are steps in the right direction. They give customers and companies some of the tools they need to resolve problems. That means you spend less time waiting on hold while companies practice call avoidance, less time sending e-mail back and forth, and more time getting work done—or having fun—on your PC.

Send your comments on technical support or any other topic you'd like to see covered in Consumer Watch *to consumerwatch@pcworld.com. Roberta Furger is a contributing editor for* PC World. ■



Mike Latschislaw finally found a monitor as good as the games he designs.

Over at the JVC games division they look to Mike Latschislaw to make their games come alive. But while he's doing it, Mike looks to something else. The new 17PX monitor from Hansol.

Because according to Mike, no other monitor sets up as easily, has as many controls (20 on-screen settings), is as practical to use, and with its radical, modern design, is just such a pleasure to look at.

So next time you've got a game on the screen, think of the guy who designs them. Then think of the monitor he uses. The new 17PX from Hansol.

Because when it comes to monitors, Mike doesn't play games.

Ideas that Shine

Hansol

For further information, call toll-free 1-888-HANSOL1(1-888-426-7651).
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configure 1

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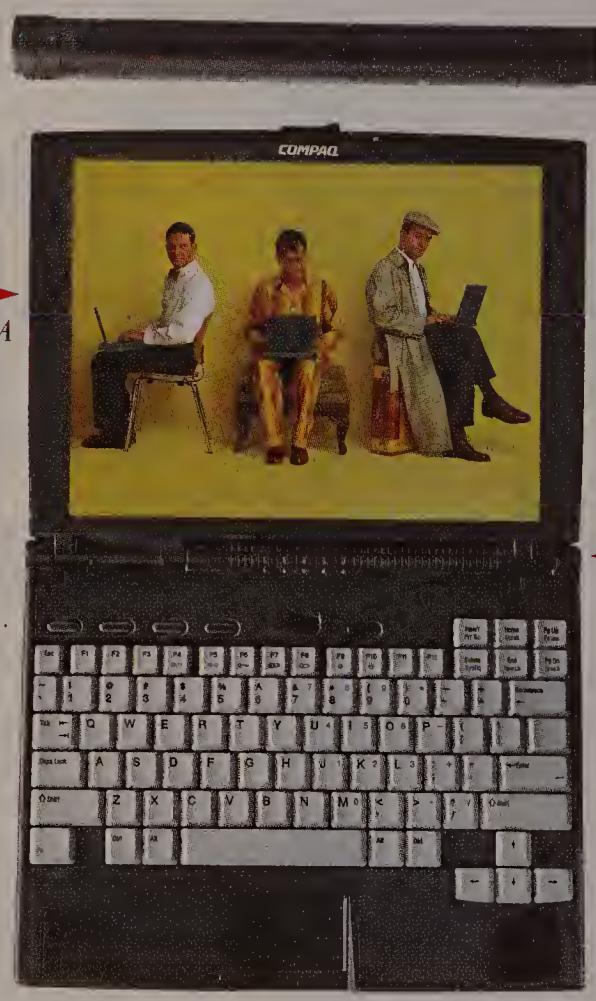
- Lithium Ion Battery
- Internal Diskette Drive



Detachable lithium ion battery also functions as a handle and a keyboard tilt.

Choice of SVGA displays from 11.3" CSTN to 11.8" CTFT.

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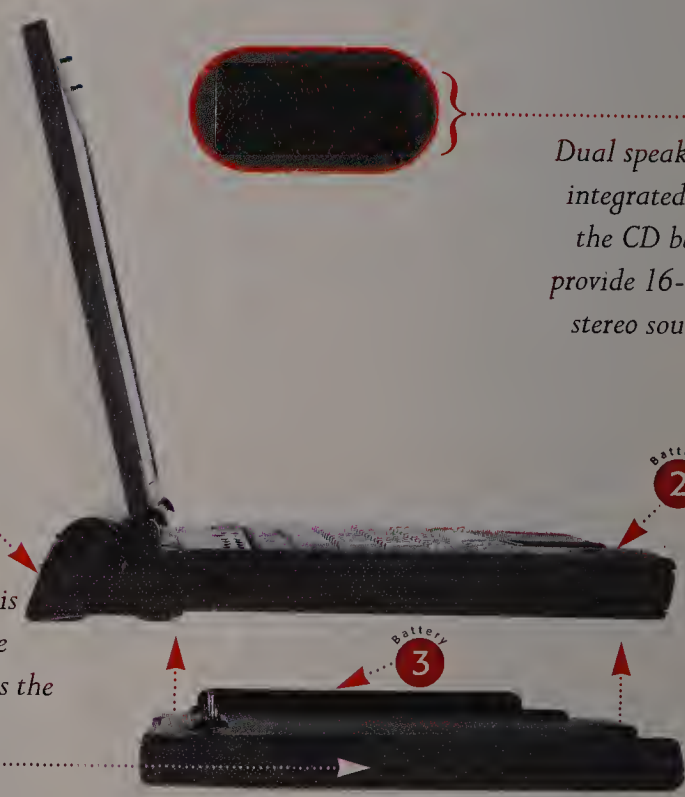
configure 2

- Multimedia
- CD-ROM
- 3 Lithium Ion Batteries
- 16-Bit Stereo Sound
- Dual Speakers
- NTSC/PAL TV Output



Dual speake integrated the CD ba provide 16-b stereo sour

This base is detachable and houses the CD-ROM.

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It's your call. On one hand, it's a full-function notebook. Or in a snap it's multimedia with CD-ROM. Or it's lean and mean. It a fax machines* and dual speakers for incredible 16-bit stereo sound. And it's Internet-ready. The new Compaq Armada 4100. It's how

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Has It Changed Your Life Yet?

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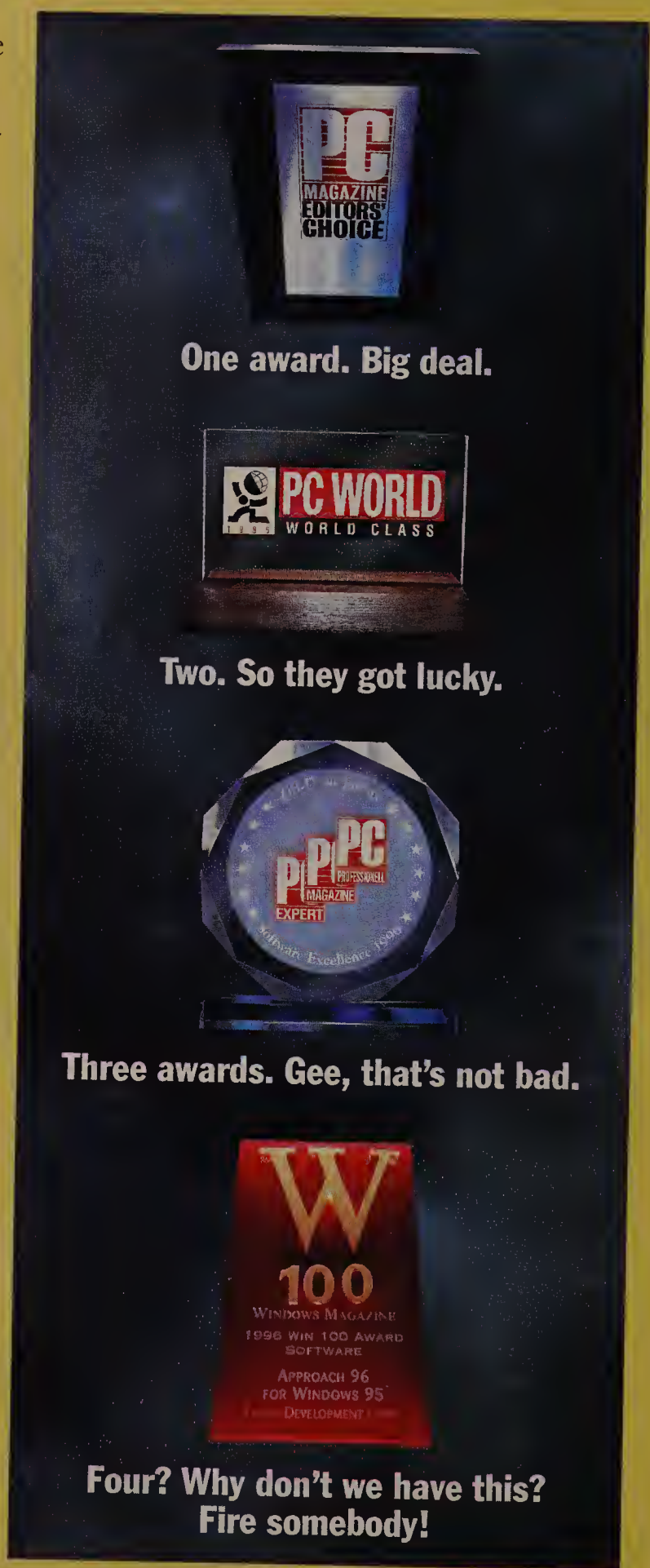
Sometimes it takes a few trophies before true excellence is recognized. Case in point: Lotus Approach.® Since its introduction, Approach has garnered more than 50 database awards, and is applauded by novices, programmers, and yes, even the critics. No other database has garnered so much praise by so many different audiences. Ever.

Approach is in a league of its own when it comes to usability. Or as PC World put it, *"Approach was our usability testers' favorite, hands down."* Its award-winning user interface guides users with ease through queries, report building, analyses, charts, and much more. Working with data simply couldn't be easier.



But don't let Approach's superior ease of use fool you. Approach satisfies the power-hungry user as well, with robust programming tools for building sophisticated, custom business solutions – fast. PC Magazine recently called it *"a great combination of simplicity and power."* No wonder the trophy case is getting crowded.

Find out for yourself why Lotus Approach is the critics' choice. Call **1-800-TRADE-UP, ext. C291** to order. Or visit our web site at **www.lotus.com.**

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Circle 138 on reader service card

Hewlett-Packard policy on paper jams ◆ Intelesys support ◆ Thumbs-up on Gateway

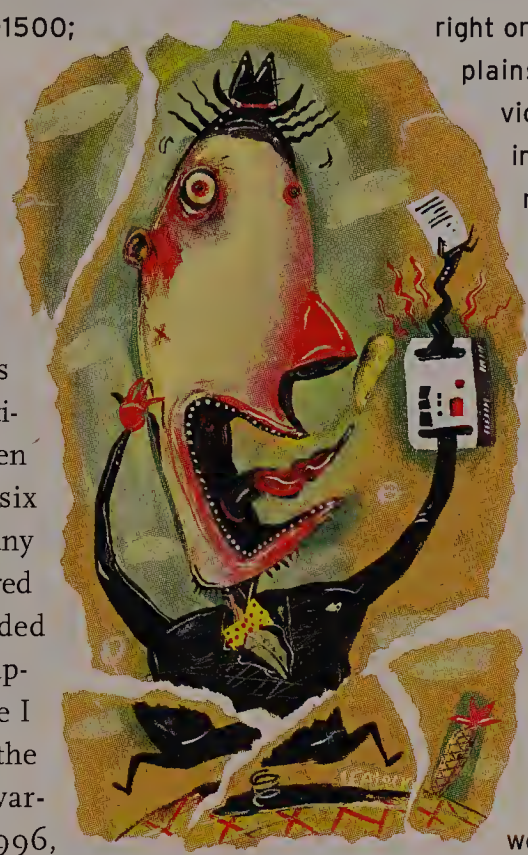
NO WARRANTY ON PAPER JAMS?

I PURCHASED A Hewlett-Packard 5-MP laser printer from my local Computer City last December. The first printer broke and was replaced; then I had problems with the second one—a corner of each page curled when I printed a document. I tried changing the paper and fanning the sheets, but the problem got worse. The paper started jamming, and I took the printer to Computer City for repairs. I had to pay $45 to have the paper cleared since paper jams are not covered by HP's warranty. I don't believe the jam was caused by improper action on my part. Furthermore, a user can't adjust the spacing on the roller (if that's the cause of the jamming) or remove the bits of paper once they get stuck.

Eli Freedman, Baltimore

Editor's response: We forwarded Freedman's letter to Hewlett-Packard and spoke with Brian Davis, support quality supervisor. Davis explained that if the paper jam is the result of a mechanical failure, the repairs are covered under warranty. He notes, however, that paper jams are generally related to the media used. "We have no control over the types of paper users feed to the machine," says Davis. He urges users to consult the manual for specifications. Although Freedman's problem wasn't covered, HP sent him a toner cartridge. Freedman reports he is very satisfied with HP's handling of the situation.

If your printer has problems, Davis advises you to call tech support *right away*. "Our staff is there to assist customers in clearing jams and other feeding problems," he says. You can reach HP tech support at 208/323-2551. You pay toll charges, but the support itself is free for products under warranty. Out of warranty, call 900/555-1500; you'll be charged a maximum of $25 per call.



WHAT HAPPENED TO INTELESYS?

IN MARCH 1995, I purchased an Intelesys Pentium Star 75 multimedia computer. When I phoned Intelesys six months later, a company called Dynasys answered the phone and provided me with technical support. Dynasys told me I was still covered by the original three-year warranty. Then in May 1996, employees of a company called Nexar began answering the phone and refused to provide technical support. Am I still legally entitled to my original Intelesys warranty through Nexar? What's going on?

Marshall Cooper, St. Margarethen, Germany

Editor's response: In August 1995, Intelesys of Fremont, California, ceased operations. Soon thereafter, Dynasys, a PC maker in Westborough, Massachusetts, purchased the Intelesys name, intending to use it. In the end, however, Dynasys changed its name to Nexar. "Dynasys did not buy Intelesys outright or the customer list," explains Craig Conrad, Nexar vice president of marketing communications. Conrad says Intelesys customers should contact Computer Universe at 415/362-1444 in San Francisco for support. Computer Universe president Khurrum Hamirani (former director of operations at Intelesys) says, "We were contacted by the Better Business Bureau in Oakland, California, about complaints from Intelesys customers, and we agreed to handle support." Hamirani says he hasn't been compensated by Intelesys's owners for providing the service. "I want to make it clear that we will help Intelesys customers out of personal good will," says Hamirani.

FLEXIBLE ON-SITE SERVICE

IN JUNE LAST YEAR, I bought a Gateway P-75. After a year it malfunctioned, and I called tech support. The technician determined that the hard drive was faulty. I had exceeded my one-year on-site warranty by two weeks, but he authorized on-site service anyway, and the new drive arrived two days later. Although it takes a while to get through to Gateway tech support, I always receive courteous, professional service.

Karen Palmer, Internet

Think you've gotten a raw deal—or a great one? PCW Advocate *wants to hear the details at advocate@pcworld.com. We'll investigate complaints and publish items of the broadest interest. Aoife McEvoy is an assistant editor for* PC World. ■

THE FINE PRINT

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1. This ad for Omni Data Communications includes the Visa and MasterCard logos, but the fine print notes that you pay a 3 percent surcharge when you charge your order.

2. Be prepared for later delivery than you might anticipate. If you pay by personal check, your order won't be shipped until your check clears the bank; the ad states that personal checks require two weeks to clear.

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ERMS: C.O.D. acceptable, add $4.75. Personal
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sidents add 5.9% sales tax. Orders returned

ILLUSTRATION: RICK SEALOCK; ICON: JEFFREY PELO

Learning to golf on narrow fairways was, in my mind, the key to improving my game. After all, I kicked my boss's butt on the doglegs, but I always seemed to hook wildly on the straight holes. With one search, I found Improve Your Golf Game, which suggested rethinking the path of the drive. So I scrolled down my search list and took a Private On-Line Golf Lesson, which profiled me as over-competitive and tense. At first I balked, but then I clicked into Better Golf Through Hypnosis and realized my type-A drive was getting me nowhere. So I signed up for a week-long Zen golf camp at the Golf Orgy Web site. Not only did the relaxation techniques improve my swing tempo, my doctor believes they also **radically increased my fertility.**

Picture and sound searches. City Guide. Bonus rewards. This is no Web index.
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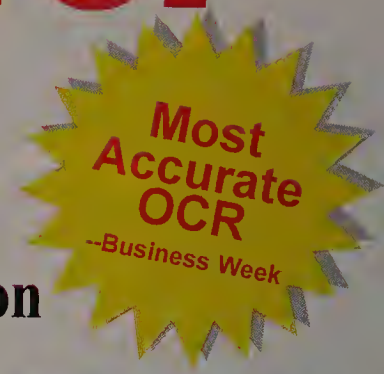

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Circle 158 on reader service card

Security flaws in IE 3.0 ◆ Toshiba memory recall ◆ Latitude docking problems

Internet Explorer 3.0 Debuts With Holes

ACCORDING TO MICROSOFT, customers downloaded more than a million copies of the company's Internet Explorer 3.0 browser in the week following its August 12 release. Not surprisingly, the initial version contained several bugs. The first one affects only Web sites that you access via a user name and a password. Instead of typing their name and password once, users of IE 3.0 had to reenter this information for every page on a site.

More seriously, Princeton University computer science researchers Dirk Balfanz and Ed Felten, who previously broke the news about security holes in Netscape Navigator, discovered a hole in Internet Explorer's security that can seriously damage a user's hard disk. If an infected document such as a Word or Excel file is embedded within a Web page, downloading that page could unleash harmful macros that execute DOS commands like Delete or Format. For more information, go to Princeton's Web site (http://www.cs.princeton.edu/sip/news/Aug96-2.html). Although the glitch could theoretically jeopardize files on the user's computer, as of press time, there had been no reports of Web pages exploiting the hole.

Microsoft has released a 441K patch that plugs the security hole and solves the password reconfirmation problem. You can find it at http://www.microsoft.com/msdownload/iepatch.html.

MORE IE PROBLEMS

MICROSOFT HAS ACKNOWLEDGED other problems with the initial release of Internet Explorer 3.0. For example, IE 3.0 called for inflated free disk space requirements (as much as 63MB); it also produced excessive flickering when loading Web pages, had difficulty refreshing pages that contained frames, and was incompatible with Trumpet Winsock and some Netscape plug-ins. Microsoft has replaced the original release—version 3.0 (4.70.1155) according to the program's Help•About dialog box—with one that fixes the erroneous disk space requirements. Download the replacement from Microsoft's Web site (http://www.microsoft.com/ie). Solutions for the other problems were not available at press time.

BUGGED?

IF YOU FIND A HARDWARE or software bug, post your report on PC World Online or send us e-mail at bugs@pcworld.com.

ICON: JEFFREY PELO

IN BRIEF

Cardinal Modem Flash ROM Upgrades

If you own a 28.8-kbps Cardinal modem, you may be able to upgrade it to 33.6 kbps by downloading and applying a Flash ROM upgrade from the company's Web site (http://www.cardtech.com/customer/download.html). The upgrade applies to Cardinal modems with any of the following model numbers: MVP2881, MVP2881S, MVP288XF, MVP288XS, or MVP288C2.

Note: Cardinal modems with the model number MVP2881Z or MVP288XF2 may or may not be upgradable via Flash ROM. To determine if yours is, download and run the 336info.exe utility from the same page. While you're on Cardinal's site, check out the new Windows 95 drivers for Cardinal voice modems that allow you to hear dial tone, dialing, and connection sounds.

DELL LATITUDE XP PORTABLE AND PC CARDS

GOT A DELL LATITUDE XP? PC Cards don't work on some early models if the system is powered up while attached to a docking station. You can work around this problem by ejecting and then reinserting the PC Card, but for a more permanent solution, download and install a new BIOS from Dell's Web site (http://wincgi.us.dell.com/filelib/10be.htm).

Faulty RAM Upgrades for Toshiba Laptops

BUG Have you recently upgraded your pricey Toshiba Tecra 710 or 720 with an 8MB, 16MB, or 32MB Toshiba NoteWorthy memory module? You may have experienced resume mode failures or intermittent memory errors. The first problem afflicts about 40 percent of the NoteWorthy EDO RAM cards sold by midsummer—all of which are populated with IBM-manufactured memory. If you have a problem module and try to use the laptop's resume mode, you'll get an error message when you power the machine back on. To find out if you've installed the faulty upgrade, open the system's memory compartment and look at the module's chips. If the letters SEC are *not* printed across the top of the chip, you're in for a headache.

A second problem occurs only with Satellite Pro 420 and Satellite 110 models. It's caused by certain SEC-labeled memory modules that use the wrong type of chip, creating intermittent memory errors. As with the Tecra modules, the only way to check for the faulty RAM is to open the upgrade compartment and look at what's printed on the chips. In this case, the faulty chips bear the part number SEC - KM416V1204AT-6. The good chips are numbered SEC - KM416V1004AT-6. Only the digit indicated in red is different.

FIX If you have one of the faulty memory modules, contact the dealer you purchased it from for an exchange, or call Toshiba Product Support at 800/999-4273. ■

{See How Business Travels}

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Up to 133MHz Pentium® processor, 256K level 2 cache and up to 16MB expandable EDO RAM all built on 32-bit PCI bus architecture*

DAZZLING MULTIMEDIA

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SIX-SPEED CD-ROM

Advanced six-speed CD-ROM unleashes the power of multimedia with sound, video, text and graphics

*On select models.

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PCMCIA slots offer expandability and connectivity while an IrDA-compliant port provides wireless data transfer

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Circle 103 on reader service card

{See How Business Travels}

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Up to 133MHz Intel Pentium processor, level 2 cache and up to 16MB expandable EDO RAM all built on 32-bit PCI bus architecture*

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SVGA color display offers sharp text and graphics displayed in crisp 800 x 600 resolution

REMOVABLE LITHIUM ION BATTERY

Lightweight, removable battery provides up to 4.5 hours of battery life to keep you going

intel inside pentium® PROCESSOR

*On select models.

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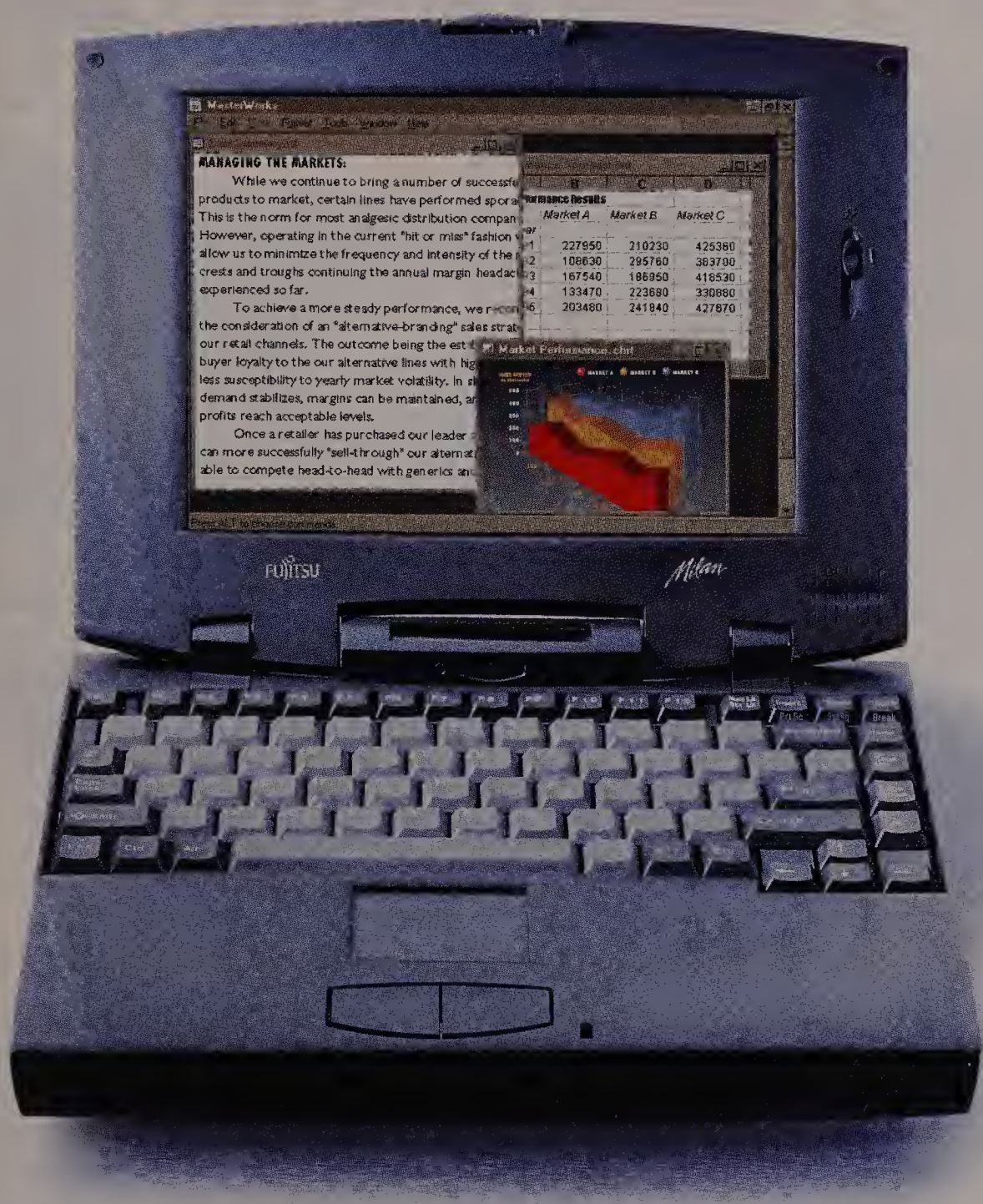

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Circle 94 on reader service card

INSIDE 54 The Fastest Notebook Yet | 56 Compaq Redefines Home PC | 60 New Audio on the Web

TOP OF THE NEWS

A new technology called **Universal Serial Bus** promises to make **installing common peripherals easier** and offers **faster throughput** than serial or parallel ports. **Products are due** by year-end.

A Better Way to Plug and Play?

OVER THE NEXT few months, vendors promoting Universal Serial Bus products will generate more noise than a Boston rush hour. Designed to replace your serial, parallel, keyboard, and mouse ports with a single connection that accepts multiple devices with the ease of Plug and Play, USB has already garnered the support of such big-name system vendors as Compaq and IBM. Peripherals giants such as Logitech, Philips, and Altec Lansing are also putting the finishing touches on the first round of USB devices.

Still, as summer came to an end, support for the technology was anything but universal. "We've been examining it for several months," said John Wandishin, director of marketing for printers at Brother International. But the company has yet to announce a product. This caution was echoed by officials at several other vendors, including Gateway 2000, U.S. Robotics, and Digital Equipment. Digital has scotched plans to produce a USB printer this year. But with backing from Intel and Microsoft, the standard has more than enough momentum to carry it through a slow start.

PLUG AND PLAY for real? USB devices will connect via simple ports and plugs, as shown above.

ONE PORT, MANY PERIPHERALS

USB DEVICES USE inexpensive connectors, each about the size of a phone jack, and can transfer data at up to 12 megabits per second—faster than common serial and parallel ports. This throughput makes USB ideal for a variety of low- and medium-speed devices, ranging from personal printers and low-resolution scanners to mice, monitors, modems, and speakers. Peripherals requiring greater bandwidth, such as video cameras, high-resolution printers, and high-capacity tape drives, work better with the faster connections provided by technologies like SCSI or the emerging IEEE-1394 standard, also known as FireWire (see "Plugging In: Upcoming High-Speed Options").

A single USB port on the back of your PC can support numerous daisy-chained devices. This arrangement facilitates installation and greatly reduces your chance of running out of ports or slots when adding peripherals. In a typical scenario, you might connect a monitor with USB ports of its own to your PC's USB port. (Monitors will still connect to a graphics card via a standard video cable.) To the remaining USB ports on the monitor, you could connect a keyboard that itself might have USB connectors, a modem, and a scanner. You could then plug more USB devices into the keyboard. None of these devices require IRQs or additional ports.

The technology claims a number of features for ▶

EDITED BY
Russell Glitman and Randy Ross

ILLUSTRATION, LEFT: JEFF BERLIN; ALL ICONS: JEFFREY PELO

JUST IN

Has Reveal Gone Under?

REVEAL COMPUTER, once a major player in the multimedia market, has all but gone out of business, according to a *PC World* investigation. Problems first came to light on the company's CompuServe forum, when customers complained of nonexistent technical support and unanswered phones. Former employees, who requested anonymity, say the firm dismissed virtually all its workers in a series of layoffs that began in January. Repeated calls to Reveal have gone unanswered, and the company's Web page and CompuServe file libraries appear not to have been updated for months. Major retailers such as CompUSA and Circuit City say they no longer carry Reveal products.

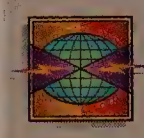
Packard Bell Settles Used Parts Suit

BEGINNING January 1, Packard Bell Electronics will post the phrase "may include components from a previously sold computer" on cartons of PCs that might contain recycled parts. The labeling is part of a settlement various government agencies reached with Packard Bell. The company, which claims no wrongdoing, will also reimburse authorities about $5 million for the investigation.

Smarter, Faster Parallel Ports

NEW ENHANCEMENTS expected next year will extend the life of parallel port technology, which is being challenged by the Universal Serial Bus and FireWire ▶

INTERNET



GET UP-TO-THE-MINUTE NEWS, including reviews of Sharp's thin and wide notebook and Compaq's 4 x 4 server with four Pentium Pro processors, at PC World Online. Just point your browser to http://www.pcworld.com/news.html.

easing installation. Later this year, Microsoft plans to add USB support to Windows 95 as an extension to its Plug and Play technology, according to Mike Glass, technical evangelist for Microsoft. In theory, if you connect a USB peripheral to a USB-equipped PC, the system will recognize the device and load the appropriate drivers. Thus you won't need to set IRQs or dip switches when adding USB peripherals. USB should also support hot swapping, so you can attach devices while the PC is on without rebooting.

Another feature should help eliminate cable clutter. USB connectors can carry electrical current, so devices that now require an AC adapter, such as modems and portable printers, may not need one, according to Jim Pappas, director of interconnect technology at Intel's architecture lab.

THE FIRST STOP

THREE INGREDIENTS are required for USB to work: a computer equipped with USB circuitry, peripherals with this circuitry, and driver software that lets these devices communicate with your PC's operating system.

Top-tier vendors such as IBM and Compaq have been shipping desktop PCs with USB ports for several months. Dell, Sony, and Toshiba plan to offer PCs with the ports. You won't pay extra for a PC with this new technology, according to Richard Cheston, a brand manager in IBM's PC division. Notebook products with USB will follow soon: Dell plans to offer a notebook with a USB connector by mid-1997. For those who want to upgrade an existing PC that has a 486 or faster CPU and a PCI bus, CMD Technology is expected to offer a USB add-in card. The PCI card, predicted to sell for $59 on the street, includes two USB ports.

By year-end, Microsoft will ship PC makers a version of Windows 95 that supports USB peripherals, according to Microsoft's Glass. PCs with the support should be available by February. So if you plan to buy a PC, be sure the vendor includes this version of Win 95. At press time, Microsoft had not said when USB support would be available to current owners of USB PCs. A retail version of Win 95 with the support is expected in 1997, but driver upgrades for current Windows users could be available as downloads from Microsoft's Web site before the retail version ships.

DAISY-CHAIN DEVICES: Keyboards, like the one shown here, and other peripherals will include USB ports so you can add compatible devices.

Inaugural Run of the Universal Serial Bus

First peripherals prepare to head out.

PRODUCTS	Vendor	Expected to ship	Price	Contact	Reader service no.
Monitors	Philips Consumer Electronics	Q4 1996	$499 to $2499 list	800/531-0039	738
Phone-modem	Mitel	Q4 1996	$349 list	800/648-3579	739
Speakers	Altec Lansing	Q4 1996	$150 street	800/648-6663	740
USB add-in card	CMD Technology	Q4 1996	$59 street	714/454-0800	741
Connector base for 17-inch monitor	Iiyama	Q1 1997	under $150 street	215/957-6543	742
Hand scanner	Logitech	Q1 1997	$130 street	800/231-7717	743
Keyboard	Key Tronic	Q1 1997	n/a	800/262-6006	744
Modem	Boca Research	Q1 1997	n/a	407/997-8621	745
Keyboard	Cherry Electrical Products	Q2 1997	n/a	800/510-1689	746
Joystick	Microsoft	1997	n/a	206/882-8080	747

n/a = not available

THE BIG NEWS: USB PERIPHERALS

USB PERIPHERALS are debuting as you read this. Most cost the same as traditional models or a bit more. The first to ship are communications and input devices, monitors, and speakers.

In November, Mitel expects to ship a $349 telephone with a 33.6-kbps modem that connects to your PC via a USB connector or a serial port. In December, Philips plans to ship a line of monitors that have three USB connectors built into the base. A 15-inch monitor will list for $499—the same price tag the non-USB model will carry. Also in December, expect to see USB speakers from Altec Lansing. The three-piece USB46 system will have a street price of $150—about $25 to $50 more than comparable units without USB. Altec Lansing claims its digital speakers sound better than their comparably priced non-USB equivalents.

Next year, expect to see USB modems, keyboards, scanners, and other input devices. The modems will likely include both a USB port and a serial port. ISDN modems with USB connectors may also appear. Unlike the slower serial port, which tops out at 115.2 kilobits per second, a USB port offers enough bandwidth to handle ISDN's 128-kbps throughput.

SLOW TO BOARD THE BUS

THOUGH INTEL'S Pappas says a USB printer will debut by year's end, at press time none of the printer vendors we contacted, including Hewlett-Packard, Epson, and Brother, had immediate plans to introduce USB versions.

Likewise, storage vendors we contacted, including Iomega,

SNAP IN, SNAP OUT: A handy USB connector is about the size of a phone jack.

Make the Right Connection

INTERFACE	Speed	Peripherals
Serial port, RS-232	115.2 kbps	mice, modems, other low-speed devices
Parallel port, Centronics to Extended Capabilities Port	800 kbps to 16 mbps	printers, scanners, external drives
Universal Serial Bus	12 mbps	all of the above
Enhanced-IDE mode 4	133 mbps	hard drives, optical drives, CD-ROM drives
Enhanced-IDE Ultra DMA/33 [1]	264 mbps	same as Enhanced-IDE mode 4
SCSI Wide Ultra	320 mbps	same as Enhanced-IDE mode 4 plus internal devices such as tape drives and high-speed scanners
IEEE-1394 FireWire [1]	400 mbps	same as SCSI Wide Ultra plus external devices such as video cameras and printers
SCSI Wide Ultra2 [1]	640 mbps	same as SCSI Wide Ultra

[1] Available in 1997.

Seagate, and HP's Colorado Memory Systems, say they have no immediate plans to release USB products. Pappas says storage devices that typically connect to parallel ports, such as removable-cartridge and tape drives, will eventually be available in USB versions.

Microsoft had not shipped the software drivers for Windows 95 at press time, so we could not verify any of the USB vendors' claims regarding speed, ease of installation, or the ability to daisy-chain multiple peripherals to a single port. As with any new technology, be prepared for complications in the early going.

Still, the risks are minimal. Many new systems will include a USB port at no extra charge, and the next version of Windows 95 will provide software support. If you have more peripherals than ports, the Universal Serial Bus could be just the ticket.

—*Randy Ross*

Plugging In: Upcoming High-Speed Options

IN ADDITION TO USB, other technologies designed to improve system performance will emerge in the coming year. Two of the most promising are the IEEE-1394 specification, also known as FireWire, and the Accelerated Graphics Port.

FireWire will offer many of the benefits of USB, plus much higher performance. By next spring you'll see FireWire add-in cards supporting speeds of 200 megabits per second, and by August 1997 you'll be able to buy cards capable of 400 mbps, says Robin Selden, managing director for the Advanced Media Products Group at Adaptec. These speeds compare to those offered by SCSI products. You'll use these fast cards for connecting home electronics devices such as camcorders to your computer.

FireWire devices will support plug-and-play installation and hot swapping and cost about the same as comparable SCSI adapter cards. Home video-editing kits based on FireWire will run from $700 to $1000.

The Accelerated Graphics Port is a high-speed motherboard connection between the graphics controller and system memory. The technology is designed to provide more realistic three-dimensional graphics and games. "It will add capability, but it won't add cost," says Jake Richter, senior editor of Jon Peddie's *PC Graphics Report*. AGP initially will operate at about 2128 mbps, twice as fast as today's PCI bus. PCs with this technology will be widely available by the end of 1997. AGP video cards will sell for around $200 to $400, about what 3-D cards sell for today, Richter says.

AGP graphics controllers store 3-D textures and bit maps in system memory instead of in more-expensive video memory.

As a result, units sporting the technology will require more system RAM: Richter estimates that systems with AGP connections will need 24MB to 32MB. But with RAM prices plummeting, he expects that by next year 32MB of RAM will cost little more than 16MB costs today. Initially, AGP will ship only on Pentium Pro PCs.

(see "A Better Way to Plug and Play?"). The new standard, called 1284.3, will make it easier to daisy-chain peripherals to a parallel port. Also due is a PCI version of the parallel port that will boost performance from the current 16 megabits per second to 40 megabits per second.

New Pentium Chip

INTERNATIONAL Meta Systems, a newcomer to the x86 CPU business, will introduce a 200-MHz Pentium-class chip with MMX multimedia-enhancing technology late next year. Intel created MMX technology to improve multimedia performance. Intel's first MMX Pentium chip will enter production early next year. AMD and Cyrix also plan to introduce MMX chips at about that time.

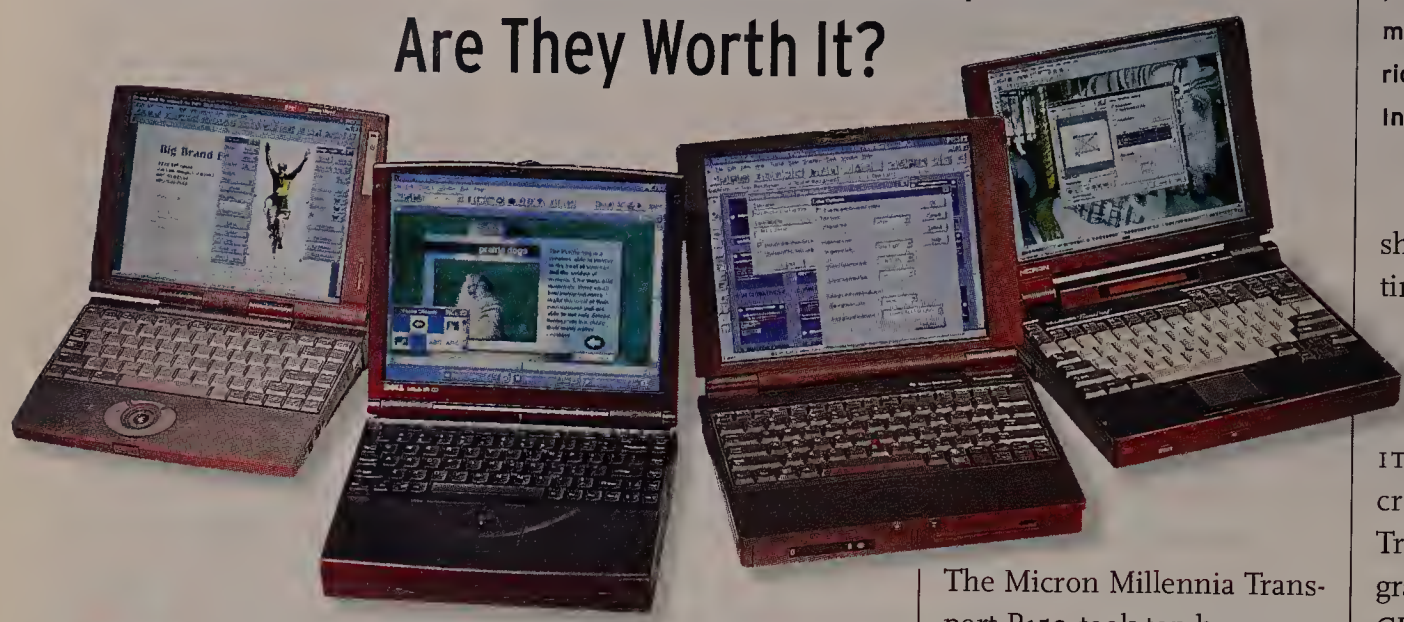
Norton Utilities 2.0

THE NORTON 2.0 BETA we examined has a host of improvements over version 1.0. A System Genie offers a simple way to customize a Win 95 computer without manually editing the Windows Registry. Virus scanning takes place transparently in the background via Symantec's AntiVirus technology. Version 2.0 also supports Microsoft's new FAT32 file system. Due this year, the utility will cost about $80.

Two Digital Cameras

RICOH AND SONY have announced digital still-image cameras for less than $900. ▶

150-MHz Notebooks Are Fast, but Are They Worth It?



FAST CLASS: High-speed P-150 notebooks offer marginal performance gains over P-133 mobile systems. From left to right : Digital, Dell, Texas Instruments, and Micron.

AS THE FIRST notebooks based on Intel's Pentium-150 processor come to market with higher prices than their P-133 predecessors' and marginal performance gains, you may find yourself asking, Why buy one?

It's not that these notebooks are slow. Dell's P-150 Latitude XPi CD with 16MB of EDO RAM recorded a score of 166 on our PC WorldBench test suite, about 10 percent better than average for similarly configured P-133 notes. But since prices are higher—by $200 or more—than prices of comparably equipped P-133 notes, it's questionable whether P-150s have enough added oomph to justify bypassing a P-133.

We tested four P-150 notebooks, from Dell, Digital, Micron, and Texas Instruments. The Micron Millennia Transport P150 took top honors as the fastest notebook we've ever tested, posting a PC WorldBench score of 189.

But these P-150 notes' overall performance increase is less than spectacular. The modest gain is explained in part by their slower bus. While P-133 notes generally use a 66-MHz bus, P-150s run at 60 MHz.

Battery life ranged from just over 4 hours for the TI to just under 3 hours for the Dell, on a par with P-133 notes.

Compaq, Gateway, and IBM should have P-150 notes by the time you read this, but none were ready in time to test.

DETAILS, PLEASE

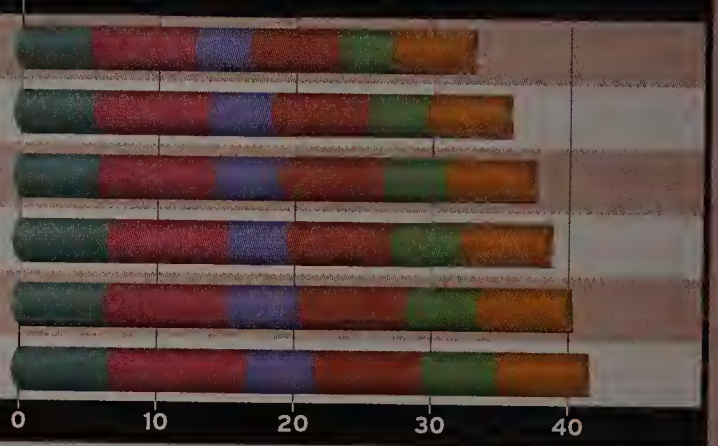
IT'S HARD NOT to like Micron's superfast Millennia Transport P150. With PCI graphics and an 8X removable CD-ROM drive, it's got all the essentials for hard work *and* fun. MPEG-1 playback software and a 12.1-inch active display are included. You also get a 2.1GB removable hard drive, a 28.8-kbps fax-modem PC Card, a second lithium ion battery, a leather carrying case, and both a touchpad and an eraserhead pointing device. The adequate speakers are conveniently located on the wrist wrest. With all this gear, the Millennia costs $5550 and

TEST REPORT

The New High-Speed Mobiles

Pentium-150 notebooks post marginal gains over Pentium-133 notebooks.

SYSTEMS	CPU	RAM (MB)	Secondary cache (K)	PC WorldBench Score
Micron Millennia Transport P150	Pentium-150	32	256	189
Micron Millennia Transport P133	Pentium-133	16	256	174
Dell Latitude Xpi CD	Pentium-150	16	256	166
Texas InstrumentsTravelMate 6050	Pentium-150	32	256	161
Average of 17 P-133 notebooks	Pentium-133	16	256	152
Digital HiNote Ultra II LTS5150	Pentium-150	16	256	149



Word 7.0 for Windows 95
Excel 7.0 for Windows 95
Picture Publisher 6.0 for Windows 95
Paradox 5.0 for Windows
WordPerfect 6.1 for Windows
1-2-3 release 5 for Windows

HOW WE TEST Higher PC WorldBench scores are better. For a description of PC WorldBench 1.0 tests, see PC World Online (http://www.pcworld.com). Data based on PC WorldBench testing conducted by the PC World Test Center. All rights reserved.

PHOTO: JOHN GREENLEIGH

150-MHz Pentium Notebooks

PRO: Ultimate mobile computing.
CON: Ultimately, prices are too high.
VALUE: It's not here; check out Pentium-133 notebooks instead.

Dell Latitude XPi CD

PRICING: From $4399
Dell Computer
800/915-3355
http://www.dell.com
READER SERVICE NO. 820

Digital HiNote Ultra II LTS5150

PRICING: From $5099
Digital Equipment
800/344-4825
http://www.pc.digital.com
READER SERVICE NO. 821

Micron Millennia Transport P150

PRICING: From $4599
Micron Electronics
800/209-9686
http://www.micron.com
READER SERVICE NO. 822

TI TravelMate 6050

PRICING: From $5499
Texas Instruments
800/848-3927
http://www.ti.com
READER SERVICE NO. 823

weighs 8.2 pounds. (By comparison, the Millennia Transport P133 with a modem and a second battery costs $5199.)

While most of the Pentium-150 notebooks follow the design of their P-133 predecessors, Dell has revamped its Latitude and integrates both a floppy drive and a 6X CD-ROM drive. However, this arrangement leaves the base thicker than most, and we found typing uncomfortable, even with the notebook tilted on its fold-out legs. Another drawback: We had to use a pen to push the CD-ROM drive's inverted button. On the other hand, the unit accommodates a Type II and a Type III PC Card simultaneously. The speakers are small slits that leave plenty of space for the expansive 12.1-inch active-matrix LCD screen. Dell uses the NeoMagic MagicGraph 2090v graphics accelerator chip set (see *Just In*, October) to get full-screen, 30-frame-per-second video playback. We like the big screen, and with the included software MPEG-1 support, video playback is great. These extras make the Latitude bulkier than most notes and heavy, at 8.4 pounds. The PC we tested has 16MB of RAM and costs $4399.

At $6447, Texas Instruments' TravelMate 6050 is the most expensive notebook in our tests. It does have a big 12.1-inch active-matrix display with backlit inverters for brighter visuals. Multimedia performance gets a boost from MPEG-1 decoding and a Zoom Video port. Video playback looks good, and the speakers sit in the wrist rest—a perfect spot to blast the senses. The TravelMate we tested has a 1.35GB hard disk, 32MB of RAM, and a 6X CD-ROM drive. The base model with 16MB of RAM and no CD-ROM drive costs $5499.

Digital's HiNote Ultra II LTS5150 is one of the thinnest, lightest notes in this class—it weighs only 5 pounds. You get 16MB of RAM and a 1.44GB hard drive, but the 11.3-inch active-matrix screen is relatively small. A multimedia module with a 6X CD-ROM drive and speaker clips to the bottom of the HiNote, bringing its weight to 5.8 pounds. The base model we tested costs $5099; the multimedia module is $699.

THE BOTTOM LINE

THOUGH MICRON'S P-150 sets a speed record and several of these P-150s offer impressive multimedia components, the combination of high prices and marginal performance gains over P-133 notes makes it hard to recommend them. Our advice: Save some money and stick with the P-133.

—*Gabrielle Mitchell* ▶

Battery-Friendly P-150 Due Soon

THE NOTEBOOKS we tested are all based on a 3.1-volt version of Intel's new 150-MHz Pentium mobile processor. Intel, though, claims it can make a 2.9-volt P-150 processor, which should be ready by the time you read this. Systems with the lower-voltage processor should have slightly longer battery life and produce less heat, allowing vendors to add more components or forgo a fan.

On the other hand, vendors who design systems for the lower-voltage chip may actually be at a disadvantage when Intel releases the notebook version of its 166-MHz Pentium sometime early next year. According to an official at Micron, designing for the new high-heat conditions that the higher-voltage processor creates will prepare the company to accommodate the 166-MHz Pentium and components such as Zoomed Video that increase a system's heat level.

Ricoh's $799 RDC-2 has many features found in the vendor's $999 RDC-1, plus adjustable exposure control. Sony's $849.99 DSC-F1 has an infrared connection to transfer images wirelessly to PCs that have IrDA ports.

Three PDAs

EARLY NEXT SPRING Corel plans to debut a personal digital assistant for under $500. The unnamed device will have a word processor, a calendar, a voice recorder, and Internet connectivity, plus support for an external CD-ROM and hard drive. Psion

will ship the $599 Series 3c, an upgrade to its Series 3a line. The 3c has a serial port for connecting to a PC, and cc:Mail and Microsoft Mail clients. Psion's new Siena line, with basic PIM features and a word processor, will cost $299 and come with 1MB of RAM.

TidBytes

One-Stop Telecom Shop: MFS WorldCom plans to offer long-distance and local phone service *and* Internet access. Companies must meet federal regulations before offering all three services, and no other provider, including AT&T, has succeeded. **Back from the ashes:** After its wildly unsuccessful introduction of SoftRAM 2.0, Syncronys Softcorp will introduce SoftRAM 3.0 this fall. We found that version 2.0 did not increase the performance of system RAM as claimed. Look for our test report next month.

ILLUSTRATION: LEFT, JAMES O'BRIEN; RIGHT, PETER ALSBERG

Compaq Redesigns the Home PC as a Portable Entertainment Center

FIRST LOOK

YOU'VE NEVER SEEN a computer quite like the Compaq Presario 3000. The innovative design packs a no-holds-barred multimedia system into a compact desktop that is easy to carry from room to room and offers the push-button convenience of consumer electronic products.

The Presario 3000 may remind industry gray-hairs of Compaq's first luggable product that launched the mobile market a decade ago, but this movable 28-pound machine boasts more features than many PCs twice its size.

So, what's unique about this system? The first thing you notice is the integrated 12.1-inch LCD panel, less than 2 inches thick. Twice as bright as typical notebook screens, this gorgeous display offers practically the same viewing area as a 14-inch monitor, and better clarity. You can tilt the screen to see it better in different lighting conditions, but it's not detachable.

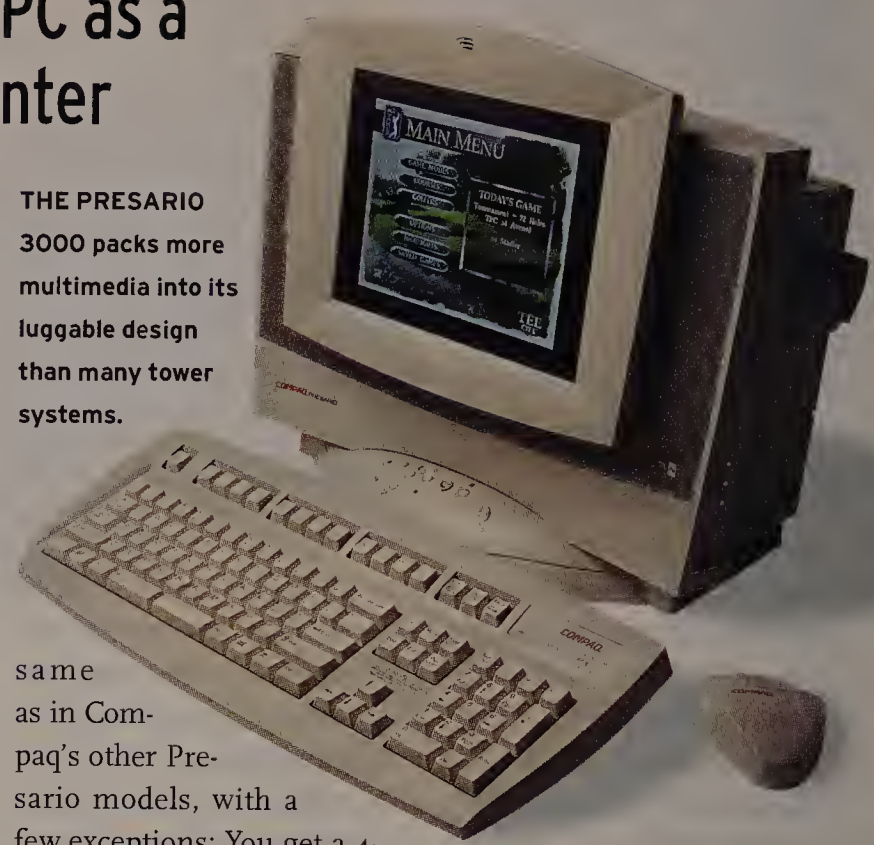
Behind the screen, a grille houses a pair of 5-watt JBL Pro stereo speakers, which deliver surprisingly decent sound. A 16-bit Sound Blaster–compatible controller is integrated on the motherboard. The guts of the system are basically the same as in Compaq's other Presario models, with a few exceptions: You get a 4-disc 6X CD-ROM drive and a built-in 33.6-kbps modem that is duplex-speakerphone capable. Through the end of the year, Compaq is also including DSVD (Digital Simultaneous Voice and Data) software. The power behind the system is provided by a P-166 CPU, 24MB of EDO RAM expandable to 128MB, and a 64-bit PCI graphics chip. A 2GB hard drive gives you plenty of storage for work and play, and two PCI and two ISA slots are free. The Presario 3000 also has two Universal Serial Bus ports, the new easy-to-connect bus design (see "A Better Way to Plug and Play?").

This entire assemblage is attached to a small base, which houses a group of buttons for controlling the onboard telephony features and CD player. Also available at the press of a button are a sleep mode and a utility that Compaq calls SmartQ, which launches help software and customizable user interfaces. The keyboard latches onto the unit, and an infrared mouse fits into a holder. A handgrip provides quick portability.

Not bad for $3499, but how does the system perform? In a demo, just fine. Unfortunately, a model was not available for us to test. For a definitive answer, look for *PC World*'s review in an upcoming Top 5 Home PCs roundup.

Nearly a year ago, the sleek, curved Acer Aspire hit the computer market and redefined the look of the PC. Compaq, always known for innovation, has changed the look of computers even more dramatically, and with the Presario 3000, it presents a choice like none we've seen before.

—*Russell Glitman* ▶



THE PRESARIO 3000 packs more multimedia into its luggable design than many tower systems.

Boom Box Notebook

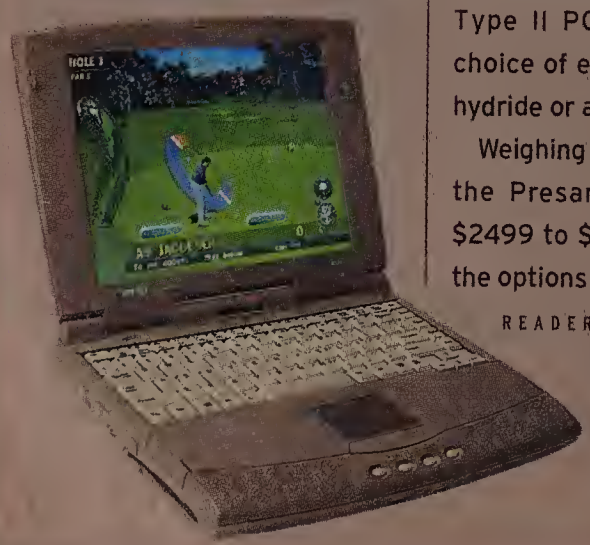
NOT CONTENT TO REDESIGN the look of desktops, Compaq has also changed the shape of notebooks, first with its Armada business line and now with the Presario 1000 multimedia notebook.

With an 11.3-inch active-matrix or dual-scan screen and 128-bit graphics, the Presario 1000 is all work when it's open, but it lets you play when you close the lid. That's because the unit's speakers and audio controls for the 6X CD-ROM drive remain exposed. The speakers produce top-quality sound—the best we've heard from an integrated mobile setup.

A 33.6-kbps modem keeps you connected, and the hard drive options—from 810MB to 1.44GB—offer lots of room. The Presario 1000 comes with 16MB of EDO RAM expandable to 48MB, two Type II PC Card slots, and a choice of either a nickel metal-hydride or a lithium ion battery.

Weighing in at about 7 pounds, the Presario 1000 lists from $2499 to $3999, depending on the options you select.

READER SERVICE NO. 805



MUSIC to your ears: The Presario 1000 delivers multimedia for work and play.

Compaq Presario 3000

PRO: Attractive, compact multimedia power.

CON: Costs more than most home systems.

VALUE: So hot it's cool.

List price: $3499

Compaq Computer, 800/652-6672

http://www.compaq.com

READER SERVICE NO. 806

PHOTOS: JOHN GREENLEIGH

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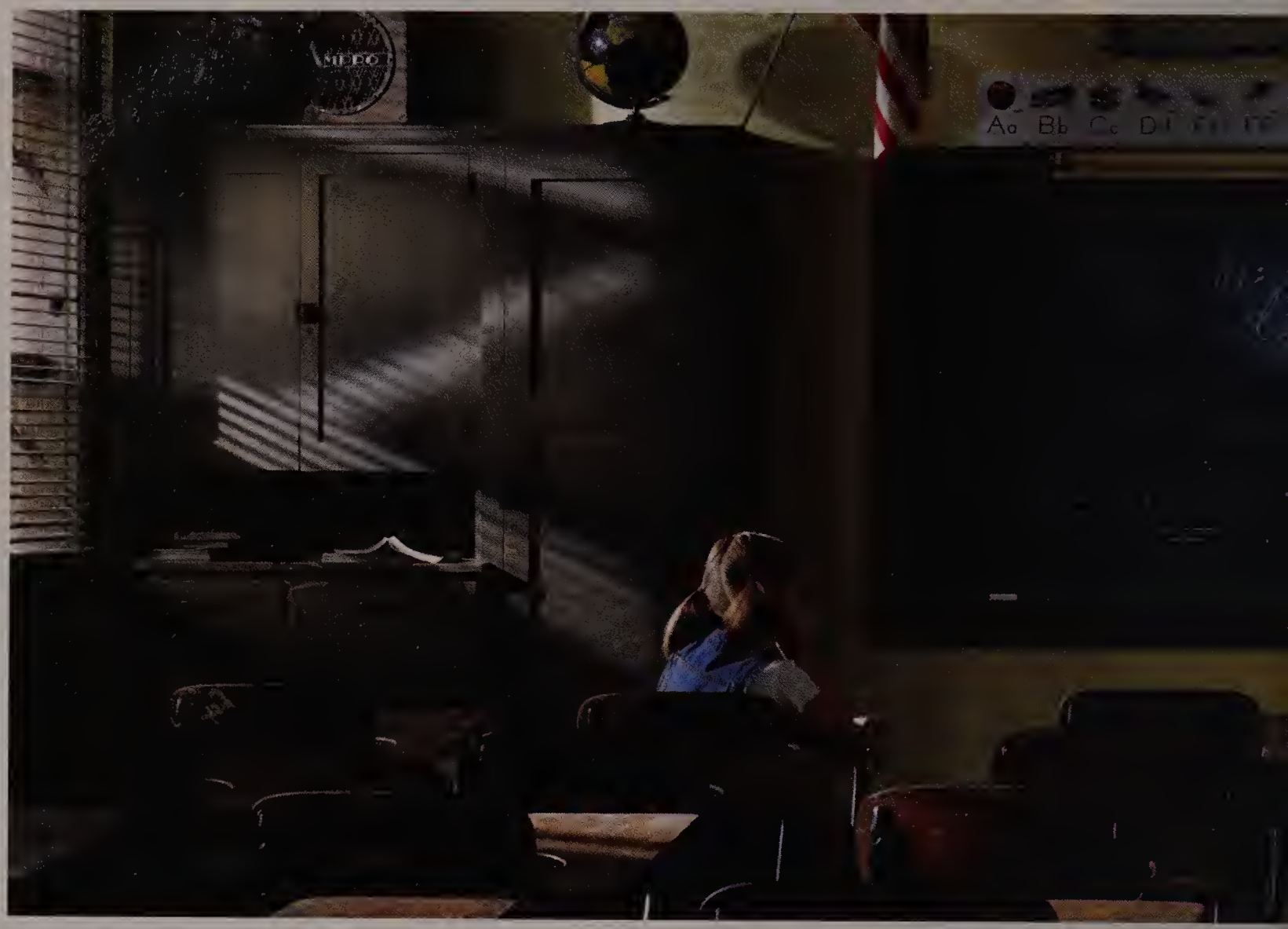
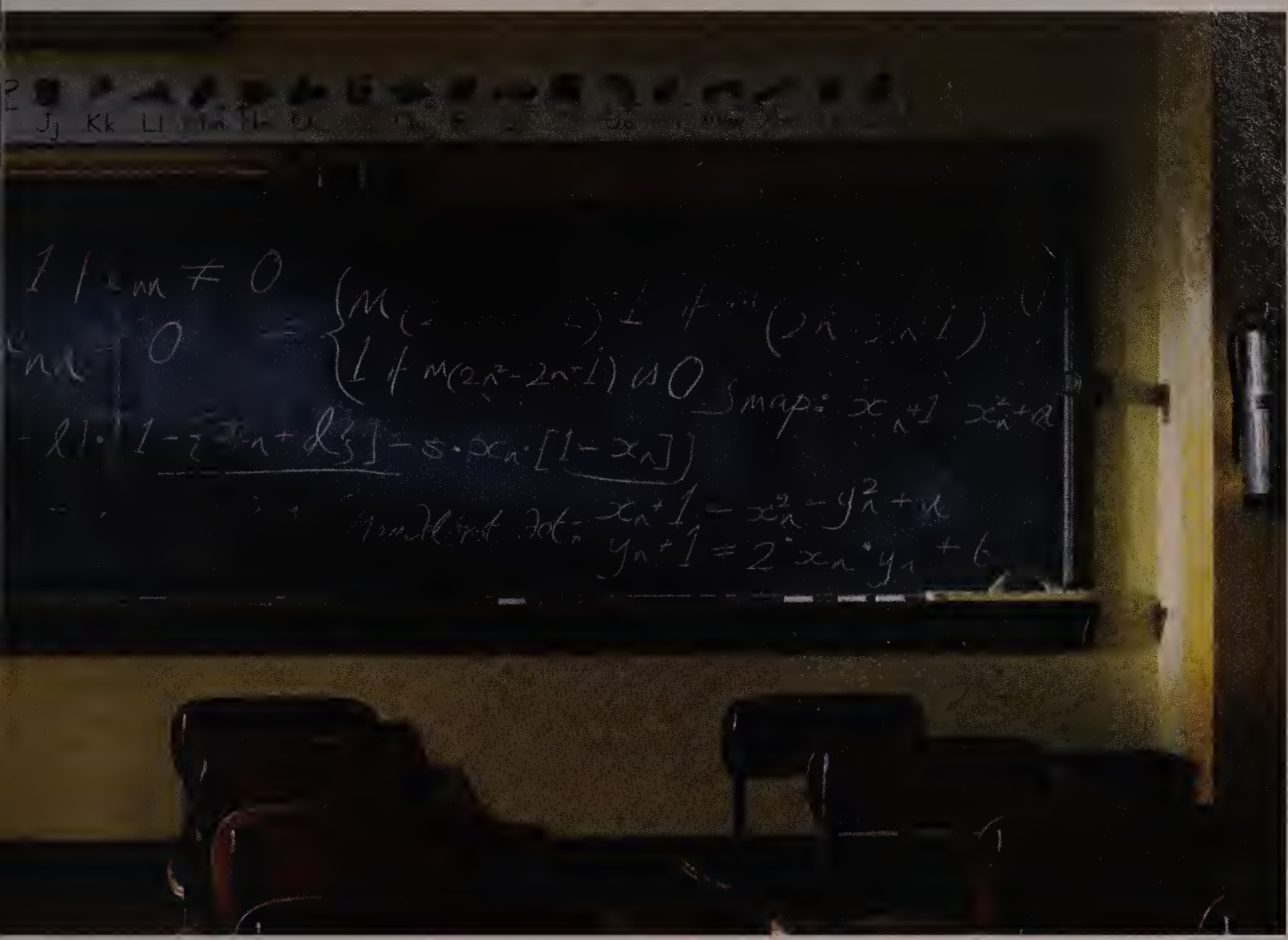


HOW MUCH do you need to know to operate a computer?
How about, "The green plug goes in the green hole."

intel inside
pentium
PROCESSOR



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What's Worse: Flying Coach or Setting Up an ISDN Videoconferencing System?

A NEW GENERATION of high-speed ISDN videoconferencing products for the PC is emerging with Win 95 software, Plug and Play support, and enhanced video. These packages benefit from the 128-kilobits-per-second throughput of high-speed ISDN phone lines, which are now available at reasonable rates in all but the most remote areas. (ISDN is shorthand for Integrated Services Digital Network.) While these systems promise to reduce time-consuming travel and enhance communications, we found setting them up as exasperating as catching the last flight out of Newark before a blizzard. In other words, a painful experience.

We looked at two recent releases: Intel's ProShare Video System 200 and Elsa's ElsaVision. Both systems can stymie all but the most expert users with a litany of hardware conflicts and driver problems. Worse, our phone company—Pacific Bell—failed to provide timely and accurate information to help us configure the packages for our ISDN lines. The silver lining? Once we worked past the initial snafus, both products let us perform real-time video calls, share Windows applications, and exchange files. Video performance was slightly better than that of earlier ISDN products we've reviewed and far better than with the PC-based videoconferencing products that use analog phone lines (known as POTS, for plain old telephone service). But while these new products may provide an alternative to face-to-face meetings, they don't do well with larger gatherings.

BETTER PACK A LUNCH: Even with Plug and Play hardware, setting up ISDN videoconferencing remains a daunting proposition.

VIDEO ON DEMAND

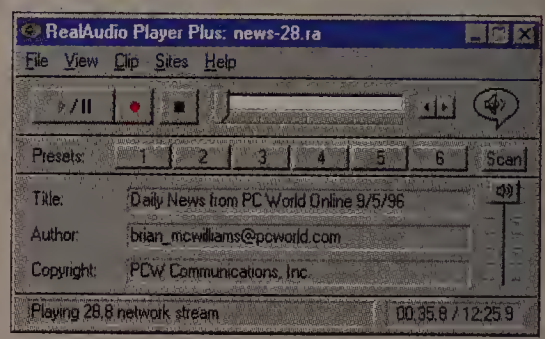
NEW STANDARDS from the International Telecommunications Union allow systems to interact with each other. The H.320 specification allows products like Intel ProShare Video System 200 and PictureTel Live200p to conduct video calls over ISDN lines, while the T.120 specification should provide data and application sharing. Currently only the ProShare system supports this specification.

The latest versions of ProShare, ElsaVision, and PictureTel's Live200p all run under Windows 95. On our two test systems—the ProShare Video System 200 and the ElsaVision—the 32-bit code produced markedly fewer system crashes than 16-bit versions had under Windows 3.11 in previous tests. Windows 95's multitasking boosted performance and enhanced video quality. In addition, the ElsaVision and Live200p systems pack everything onto a single full-length PCI card, whereas earlier products required as many as three ISA cards. Intel's ProShare, however, still comes as a two-board set. ▶

WEB BROWSER

Testing 1, 2, 3...New Web Audio Formats

IF YOU HAVEN'T HEARD RealAudio, you've at least heard about it. But it's not the only way to get audio on and off the Internet. If you want to record sound files, Voxware's **ToolVox** audio kit (http://www.voxware.com/download.htm) is great for handling speech files. The kit has great compression and lets you change tone, pitch, and speed with the dexterity of a sound engineer. Macromedia, the leader in Web multimedia, has improved **Shockwave** (http://www.macromedia.com/shockwave/new/). It now supports streaming audio, and its sound quality is better than RealAudio's. That's because Macromedia has better *codecs*, or algorithms your PC uses to translate sound files. Another audio alternative comes from FastMan, which recently launched the **Rapid Transit** player, a high-compression plug-in that reads its own .lcc files. You won't see these upstart sound files often, but if you do, go to http://monsterbit.com/rapidtransit/ to get the software to hear them. RealAudio remains the leading source of audio on the Web. If you're among the addicts of this popular audio file format, consider upgrading to the new **RealAudio Player Plus** (http://www.realaudio.com/). The new decoding software gives you an interface that behaves like a car radio, allowing for station presets; in addition, you can record files. Now the real trick: finding something interesting to listen to.



REALAUDIO PLAYER PLUS has a new look that includes a preset channel option.

—Richard Overton

PHOTO: GERRY GROPP

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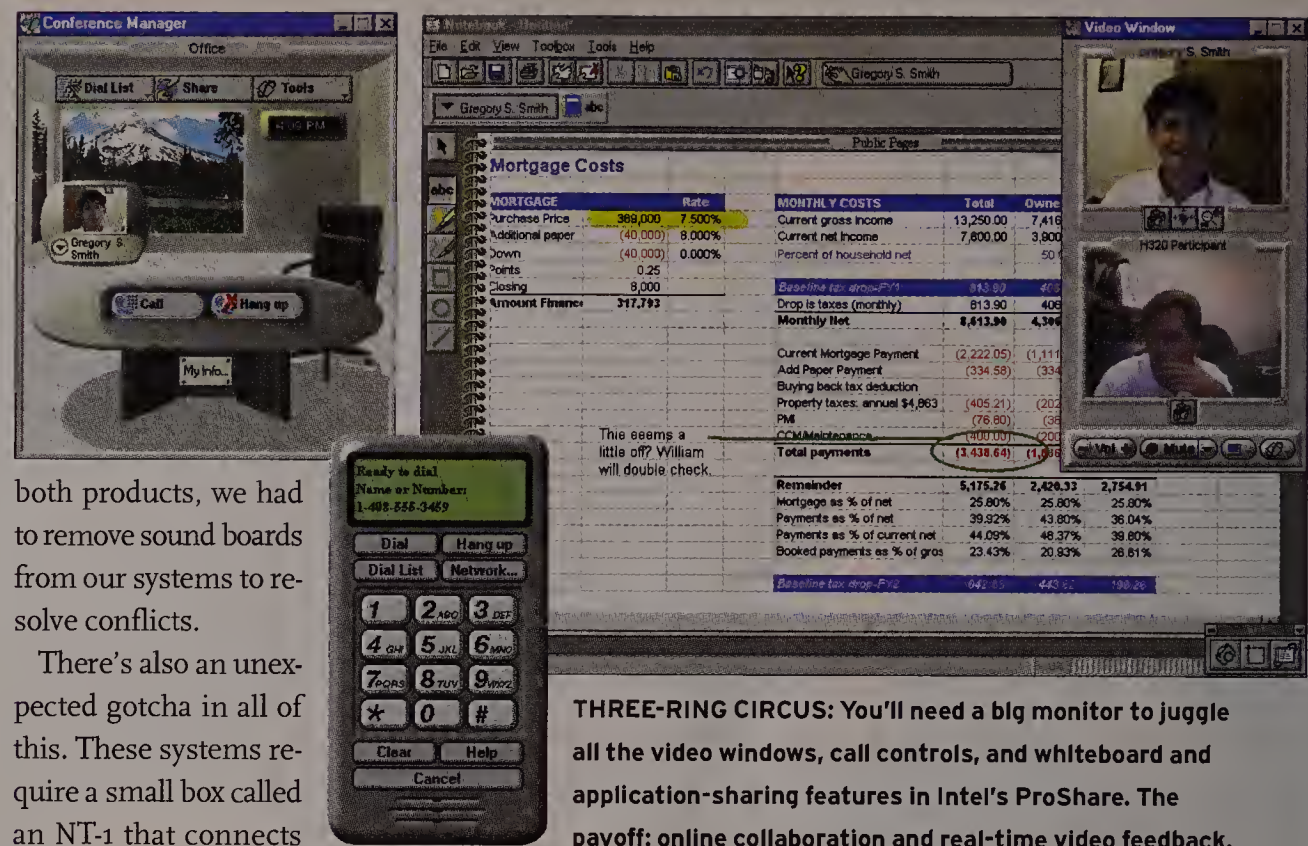
Walter Payton as photographed by Lee Crum.

Only ElsaVision takes full advantage of video-savvy graphics cards that use Windows 95's DirectDraw interface to speed frame rates and enhance image quality. The downside: The system won't work with older graphics cards lacking DirectDraw capability. Still, none of the systems force you to throw out your existing graphics card in favor of the one in the package—a real problem in earlier products.

PROBLEMS, PROBLEMS

IN SPITE OF ITS ADVANCES, PC-based videoconferencing is too complex for most users to set up on their own. All these packages present a tangle of wires for cameras, microphones, speakers, and ISDN peripherals, which must be hooked into hard-to-reach ports. Even with Windows 95 Plug and Play, installing ElsaVision and ProShare took hours of trial and error. With both products, we had to remove sound boards from our systems to resolve conflicts.



THREE-RING CIRCUS: You'll need a big monitor to juggle all the video windows, call controls, and whiteboard and application-sharing features in Intel's ProShare. The payoff: online collaboration and real-time video feedback.

There's also an unexpected gotcha in all of this. These systems require a small box called an NT-1 that connects between the ISDN phone jack and the PC videoconferencing card. But none of the vendors supply an NT-1 unit, which typically costs about $150 on the street.

We also had to deal with the ISDN challenge. We thought we knew the specifics of our ISDN lines, but when we tried to dial out, both packages said our service provider identification (SPID) numbers were invalid. Turns out, Pacific Bell had changed the SPIDs on one of the lines since we last used it, while the other line used a different SPID format than we thought. When new SPIDs failed to solve the problem, Pac Bell began guessing—"try changing 415904988301 to 415904988300," and so on. After a day of this, we went to another ISDN line, which worked on the first try.

HARD AT WORK

Once we cleared the setup headaches, the ProShare Video System 200 worked surprisingly well. On a Pentium-120 with an ATI mach64 graphics adapter, it delivered reasonably smooth video and audio that stayed in sync with one another. Its image quality was vastly superior to that of POTS products, such as Creative Labs' ShareVision 300 and Intel's Video Phone. A sensible interface made juggling video and applications easy, although you need a 17-inch monitor to accommodate everything.

We had mixed success with ElsaVision. The product relies on DirectDraw to speed video, forcing us to install a compliant graphics adapter. Also, ▶

VIDEOCONFERENCING FEATURES COMPARISON

FEATURES	Elsa ElsaVision	Intel ProShare Video System 200	PictureTel Live200p (not tested)
List price	$1649	$1499	$1495
Add-in boards number/type	1/PCI	2/ISA	1/PCI
Bundled hardware	camera, headset	camera, headset, speakers	camera, headset, speakers
Also functions as ISDN modem	●	○	●
Operating systems	Windows 95, Windows 3.1	Windows 95, Windows 3.1	Windows 95
System requirement [1]	486DX-33 with 16MB of RAM	486DX2-66 with 16MB of RAM	486DX2-66 with 16MB of RAM
Plug and Play	●	●	●
Multipoint connections	●	●	●
Whiteboard	●	●	●
Application sharing	●	●	●
Supported standards			
H.320	●	●	●
T.120	○	●	○ [2]
TAPI	●	○	●
Customer support			
Warranty (years)	3	1	1
Toll-free support	○	○	○
Daily support (hours)	10	10	24

● Yes ○ No [1] Company minimum; Pentium system recommended. [2] Due first quarter 1997.

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TEXAS INSTRUMENTS

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Circle 242 on reader service card

EYES AND EARS: The Intel (left) and Elsa cameras sit atop your monitor and provide controls for tweaking outbound video quality.

the ElsaVision board would connect on only one of the two 64-kbps data channels, resulting in slow frame rates (although image and audio quality remained high).

Both products use Intel's whiteboard and application-sharing software. The whiteboard works like a digital scratch pad, allowing both parties to add images, edit text, and select from a palette of drawing tools to highlight, circle, and strike out anything on the board. Application sharing lets users collaborate on documents and files. While users at either end can edit documents, determining who has control of the mouse and keyboard can become confusing.

When either the whiteboard or application sharing is launched, the video temporarily freezes. We noticed that graphics-intensive operations, such as scrolling or jumping to another page, caused prolonged interruption of video updates, though audio continued uninterrupted.

AVOID THE PAIN

CAN PC-BASED videoconferencing supplant face-to-face meetings? For conversations between two people, the answer is yes; with larger gatherings, it's difficult to get useful visual detail.

More important, can you avoid configuration hassles? You can if you purchase your videoconferencing system and ISDN line at the same time and tailor your ISDN order to the product. If you have an existing ISDN line, ask your telephone company about its configuration—or consider hiring a consultant. —*Greg Smith and Michael Desmond*

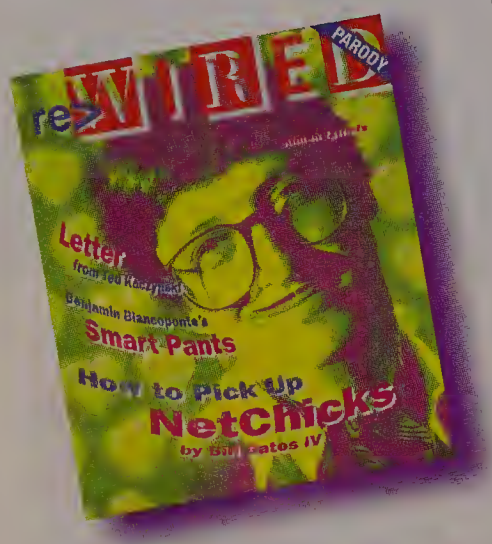
Elsa ElsaVision

PRO: Comes on a single PCI card.
CON: Problems attaining optimal ISDN throughput; setup is a bear.
VALUE: Good for cramped systems.
List price: $1649
800/272-3572
http://www.elsa.com
READER SERVICE NO. 807

Intel ProShare Video System 200

PRO: Good video, synced audio.
CON: Video frame rate slows with application sharing.
VALUE: Beats flying coach.
List price: $1499
800/538-3373
http://www.intel.com
READER SERVICE NO. 808

How to Pick Up NetChicks, or Is Wired Tired?



BOOK REVIEW

PREOCCUPATION with things cyber is a mania ripe for satire. On the heels of Stale, the online send-up of Microsoft's webzine, Slate, comes *re>Wired* (Harper Collins, 1996, 800/742-7831, http://www.harpercollins.com), a clever $12.50 parody of *Wired* magazine.

The book is the work of Tom Connor and Jim Downey, who also wrote two "Martha Stuart" parody books. With articles like "Bill Gates' Guide to Picking Up NetChicks" and a piece on a hot IPO from the fledgling "Pubescape," *re>Wired* goes for the obvious jokes. But it's nailed *Wired*'s unrelenting *cyber-über-alles* attitude cold.

Re>Wired is especially funny when mocking those apocalyptic proclamations that are a signature of *Wired*. In a roundtable discussion on twenty-first century media, Newt Gingrich, Barry Diller, and John Barry Barleycorn (a play on John Perry Barlow, the Grateful Dead lyricist and cyberpioneer) debate the future of the Internet: "Cyberspace transcends our very existence," says Barleycorn. "It can do whatever it pleases. It knows no laws. It's more important than anything ever."

Another feature, "The Coolest Chat Rooms," details some of the hottest chat sites on the Internet, like #Meatweavers (for those who like to weave processed meat into furniture) and the Zen Chat Garden ("...enjoy the silent flicker of the cursor on the pure whiteness of the screen").

You'll also find a Jonathan Swift–like "modest proposal" to implant software into newborn infants, and a hilarious celebrity profile of a homicidal hacker. *Re>Wired* is the perfect remedy for anyone who's started taking technology too seriously. —*Glenn McDonald* ■

POP QUIZ

Quick: Which of the following quotes were published in *Wired*, and which come from the parody *re>Wired?*

A) The U.S. is no longer a democracy, but Government by Hallucinating Mob, driven mad by television.
B) War is never anything less than accelerated technological change.
C) Millions of online genetic algorithms are hacking the techno-medium of the global cybertribe.
D) The infrastructure of trend dissemination is owned in America.

Answer: C) is from *re>Wired*; the rest are from *Wired*.

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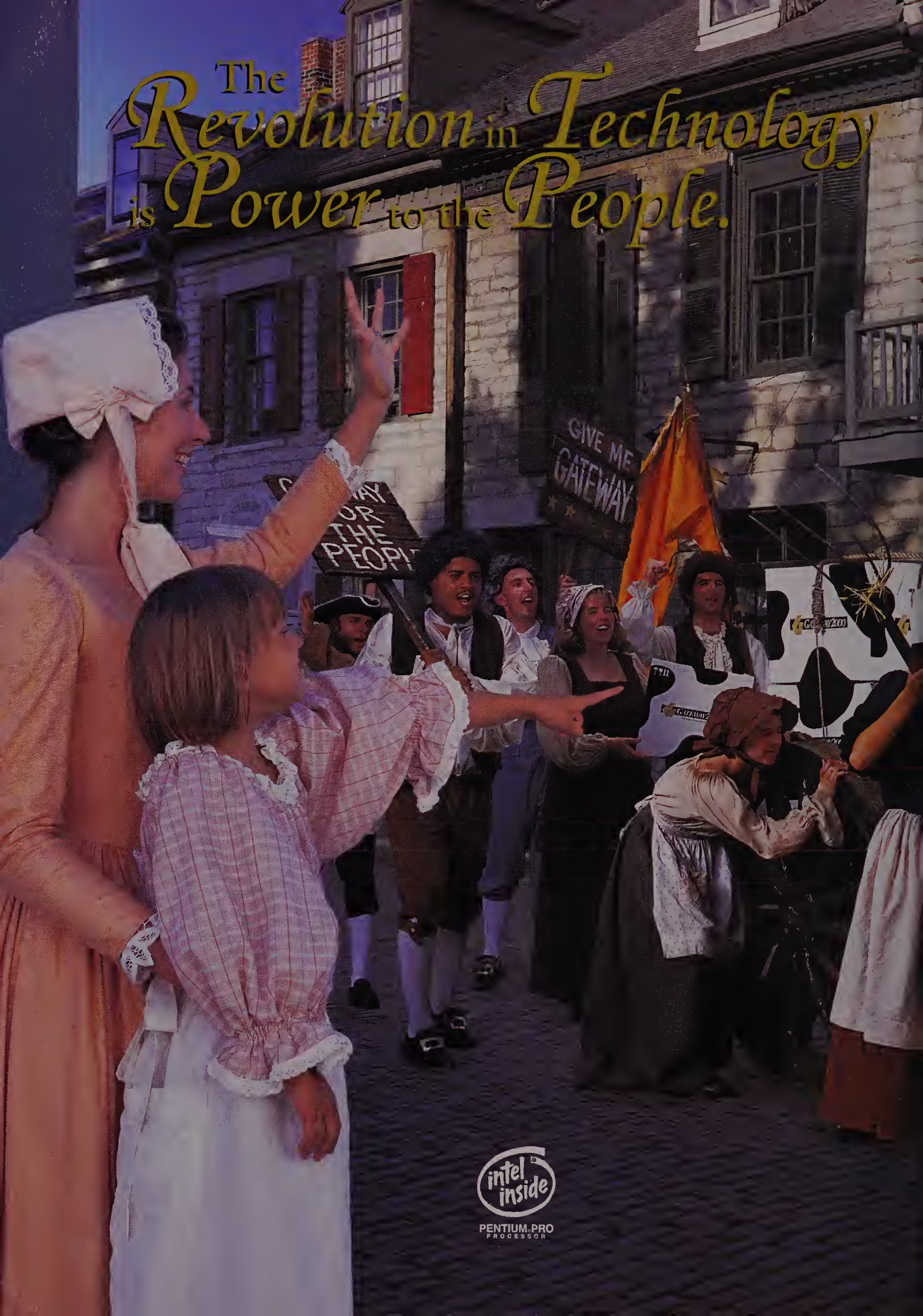
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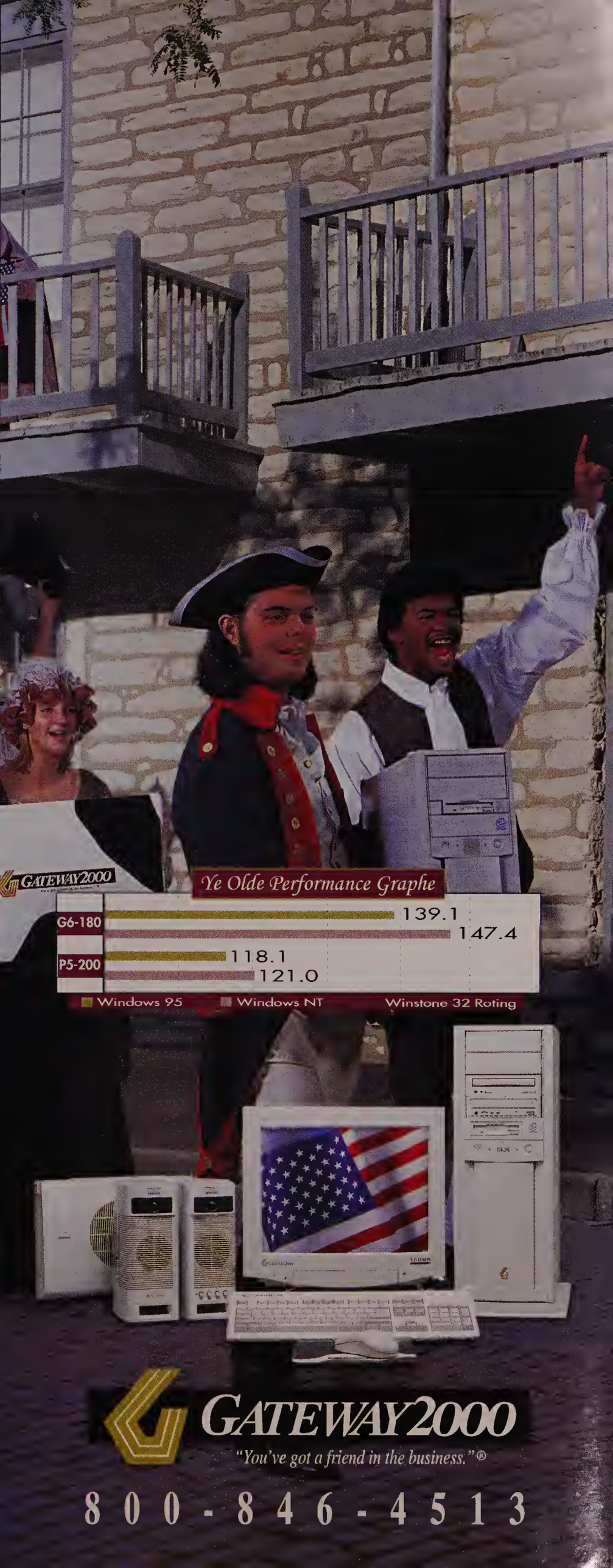
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...with *Service* and *Value* for *All!*

The American revolution, born of small acts of defiance and insurrection and nurtured through the spirit of people it sought to empower, crystallized on July 4, 1776, when the Founding Fathers set down their historic Declaration of Independence.

More than two centuries later, Gateway affirms that our PC revolution remains focused on human need by establishing a Customer Declaration of Independence.

Customer focus led to Gateway's development of a whole new kind of computer, the Destination™ Big Screen

intel inside pentium processor

PC. An alliance between the PC and television, the Destination system is yet greater than the sum of those parts. Its powerful computer heart, huge 31-inch-diagonal screen and television capabilities make it truly a servant of the people, especially when they assemble in groups.

By declaring itself free of self-limiting thought, Gateway 2000 developed a whole new category of computer, while reaffirming its devotion to service and value. Thus the PC revolution — a revolution sustained by the people it serves — marches on.

CUST

Declaration

When in the course of human affairs
computer products to enhance the lives
the purveyors of such products to meet

Therefore,

KNOWLEDGE being key to
manufacturers shall employ sales repr
freely offered information.

PC COMPANIES shall not
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BEING THE BEST JUDGE
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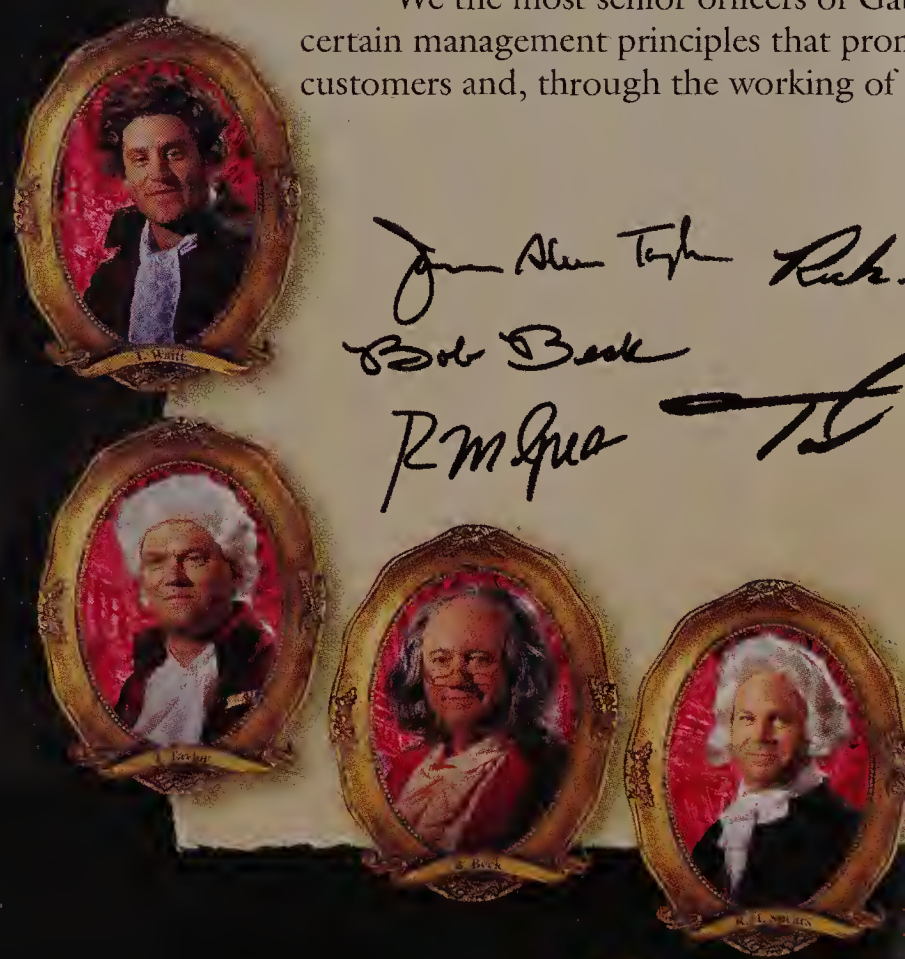

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- 32MB Synchronous DRAM
- 256K Pipelined Burst Cache
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- STB® 2MB VRAM Graphics Accelerator w/ Cable-Ready TV Tuner
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- Wireless Keyboard w/ Integrated EZ Pad™ Pointing Device
- Wireless Field Mouse® Remote
- Four-Channel RF Receiver
- Microsoft® Windows® 95
- Destination Software Collection

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D6-200

- Intel 200MHz Pentium Pro Processor
- 64MB EDO DRAM
- 256K Internal Cache
- Destination 31" VGA Monitor
- STB 2MB VRAM Graphics Accelerator w/ Cable-Ready TV Tuner
- 3GB 11ms EIDE Hard Drive
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- STB 2MB VRAM Graphics Accelerator w/ Cable-Ready TV Tuner
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# of Independence

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way 2000 do humbly commit ourselves to
ote, protect and defend the interests of our
e marketplace, our competitors' customers.

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4 5 1 3

Multimedia Systems

P5-133 FAMILY PC

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- 2MB DRAM, 64-Bit PCI Graphics
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- 16-Bit GATEWAY™ Sound
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- Generations II Software Collection

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- 256K Pipelined Burst Cache
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- 2GB 11ms EIDE Hard Drive
- 8X CD-ROM/3.5" Diskette Drives
- 16-Bit Gateway Sound
- Altec Lansing ACS-40 Speakers
- TelePath 33.6✦ Data/14.4 Fax Modem *for Windows* with Speakerphone
- 7-Bay Mini Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- Generations II Software Collection

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G6-180 FAMILY PC

- Intel 180MHz Pentium Pro Processor
- 32MB EDO DRAM
- 256K Internal Cache
- Vivitron17™ .26dp Monitor (15.9" viewable)
- 2MB DRAM, 64-Bit PCI Graphics
- 2GB 11ms EIDE Hard Drive
- 8X CD-ROM/3.5" Diskette Drives
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- MS Windows 95
- Generations II Software Collection

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- MS Office 95, Professional Edition
- Generations II Software Collec

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P5-133

- Intel 133MHz Pentium Processor
- 16MB Synchronous DRAM
- CrystalScan15 .28dp Monitor (13.9" viewable)
- 2MB DRAM, 64-Bit PCI Graphics
- 1GB 10ms EIDE Hard Drive
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- 7-Bay Mini Tower Case
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- MS Windows 95
- MS Office 95, Professional Edition

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P5-166

- Intel 166MHz Pentium Processor
- 16MB Synchronous DRAM
- 256K Pipelined Burst Cache
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- 2MB DRAM, 64-Bit PCI Graphics
- 2GB 11ms EIDE Hard Drive
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- MS Office 95, Professional Edition

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P5-200

- Intel 200MHz Pentium Processor
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- 256K Pipelined Burst Cache
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- 2MB DRAM, 64-Bit PCI Graphics
- 3GB 11ms EIDE Hard Drive
- 8X CD-ROM/3.5" Diskette Drives
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- 104+ Keyboard & MS Mouse 2.0
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- MS Office 95, Professional Edition

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- Intel 180MHz Pentium Pro Process
- 32MB EDO DRAM
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- Vivitron17 .26dp Monitor (15.9" viewable)
- 2MB DRAM, 64-Bit Graphics
- 3GB 11ms EIDE Hard Drive
- 8X CD-ROM/3.5" Diskette Drives
- 7-Bay Mini Tower Case
- 104+ Keyboard & MS Mouse 2.0
- MS Windows 95
- MS Office 95, Professional Edition

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S5-120

- 11.3" DSTN SVGA Color Display
- Intel 120MHz Pentium Processor
- 16MB EDO DRAM expandable to 40MB
- 256K Pipelined Burst Cache
- 1MB EDO Video RAM
- Zoomed Video Port
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- Zoomed Video Port
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- 16-Bit Sound & Stereo Speakers
- Lithium Ion Battery & AC Pack
- 85-Key MS Windows 95 Keyboard
- Carrying Case
- MS Windows 95
- MS Office 95, Professional Edition

$3899 Business Lease† $143/mo.

S5-133 Best Buy

- 12.1" Active Matrix SVGA Color Display
- Intel 133MHz Pentium Processor
- 40MB EDO DRAM
- 256K Pipelined Burst Cache
- 1MB EDO Video RAM
- Zoomed Video Port
- 1.3GB Hard Drive
- Modular 6X CD-ROM Drive
- Modular 3.5" Diskette Drive
- 16-Bit Sound & Stereo Speakers
- 28.8 PCMCIA Fax/Modem
- Lithium Ion Battery & AC Pack
- 85-Key MS Windows 95 Keyboard
- Carrying Case
- MS Windows 95
- MS Office 95, Professional Edition

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✦Maximum data transfer rate dependent certain variables including particular modems with which you are communicat telephone lines, communications softwar and communications protocols.

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- Extended Three-Year On-Site Agreement*
- Priority 800 Number For Access to Technical Experts
  With system purchase **$99**
  Within current on-site service agreement **$129**

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Gateway accepts most major credit cards and C.O.D. terms, with net 30-day terms and leasing options available to qualified commercial customers. Ask a sales representative today about finance options.

Call the GATEWAY™ component add-ons division at 800-846-2080 for our complete line of extras for Gateway customers. Sales Hours: 7am-10pm Weekdays (CT).

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NEW PRODUCTS

New Vision: AST's Home PC With TV, Videoconferencing

AST'S NEWEST HOME PCs offer videoconferencing capabilities, but setup is tricky.

DESKTOP

INTEL HAS A VISION for the home computer: The company is hoping to transform it into a multimedia communications center. For months, the chip giant has pushed key technologies to enable ubiquitous PC-based video conferencing and to promote a convergence of the PC and TV. At last those efforts have borne fruit, with this fall's release of consumer-oriented PCs (from AST, Compaq, and other vendors) that incorporate these technologies. Unfortunately, while the technologies themselves are intriguing, experts say that the future they promise is not as close at hand as Intel makes it out to be.

One of the first such systems, AST's **Advantage 9312 Communicator PC,** is a Pentium-166 minitower packed with Intel's Video Phone and Intercast technologies. The system boasts a configuration comparable to those of top-ranked PCs tested in *PC World*'s Top 20 reviews, with a 256K secondary cache, 24MB of RAM, and a 2.5GB hard drive. It also sports an 8X IDE CD-ROM drive, an integrated ATI CT Mach 64 graphics accelerator with 2MB of DRAM, and a 16-bit sound card including wavetable MIDI hardware. The 9312 had average performance for a P-166 in the PC WorldBench test suite, garnering a creditable score of 197.

The name of this new model—the Advantage 9312 Communicator PC—says it all. Inside the chassis is a combination video capture and TV tuner card that allows the unit to process signals from the bundled analog video-conferencing camera as well as from cable and broadcast television channels. An internal 28.8-kbps DSVD modem provides quick Web browsing and has features for handling real-time video.

IS ANYBODY HOME?

VIDEO CONFERENCING is at the heart of the Communicator PC. Unlike earlier video conferencing systems, which worked only with expensive digital ISDN phone lines, AST's Video Phone uses existing analog lines. More important, the Video Phone employs an industry-standard video conferencing scheme—known as H.324—that should allow all H.324-compliant PCs to talk to each other.

We tried out a prerelease version of the Communicator PC's Video Phone capability, with mixed results. We were unable to make a video connection from my office because multiplexed phone lines prevented data synching—a growing problem as more homes add second and third phone lines. After moving to a new site, we found that the video quality was superior to that of earlier analog video conferencing products, but the frame rates and image quality did not compare well with those of higher-bandwidth ISDN-based products such as Intel's ProShare. We also encountered the dirty little secret of PC-based multimedia: a wild tangle of cables, wires, and

AST Advantage 9312 Communicator PC

PRO: Intercast technology for TV combined with Web data.

CON: Costly, tricky setup, and some hitches to videoconferencing.

VALUE: Not quite ready for prime time.

800/876-4278

Street price: $2599

READER SERVICE NO. 748

PHOTOGRAPHS: MARC SIMON

jacks that will overwhelm all but the hardiest users.

Intel and its customers are targeting a broad consumer market, including empty-nesters with grandchildren; analysts say that such a choice of markets may create problems. "I think ease of use is going to be an issue. Video conferencing takes some setup to do, and it's not going to be as easy as a traditional phone call," says Bruce Ryon, director of multimedia research at Dataquest. The system would also be costly for many grandparents.

Still, since the H.324 standard has garnered wide market support—both Intel and Microsoft are rolling out products using the scheme—Ryon expects that within five years, this type of video conferencing could be common.

TV'S NEXT BIG THING

ALSO SHOWCASED in the Advantage 9312 Communicator—and more promising—is Intel's Intercast technology, a new scheme that combines broadcast TV, real-time data downloads, and Web browsing into a single experience. Intercast delivers data to the PC by using the video blanking interval in a broadcast or cable TV signal. The signal is then received by a preinstalled TV tuner card, and the incoming video is displayed in a full or one-quarter screen. Simple screen controls allow you to switch channels, adjust settings, and capture still or moving images to disk.

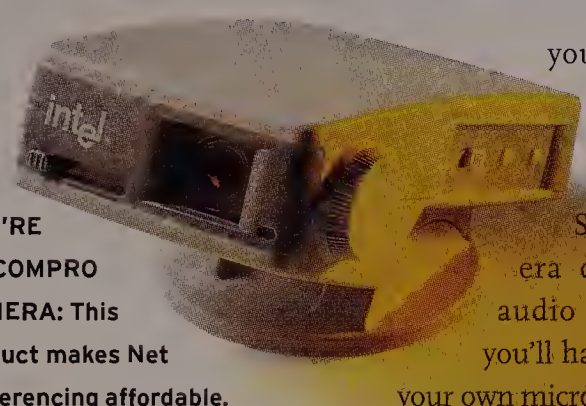
With Intercast, broadcasters can transmit data so as to add digital content to their programming. During the Atlanta Olympics, for example, NBC provided scores, stats, and background information for Intercast testers. However, the service may be better suited to professionals who need to track stock markets while monitoring CNBC or other news channels at the office.

Intercast's interface includes an integrated Web browser window. When CNN airs a story, you may be invited to click on related links, listed in the separate window. At press time, NBC, CNN, and MTV's M2 channel were broadcasting using Intercast, Intel said.

—*Michael Desmond*

EDITED BY
Laurianne McLaughlin and Gabrielle Mitchell

Low-Cost Camera Brings Videoconferencing Home



YOU'RE ON COMPRO CAMERA: This product makes Net conferencing affordable. Included D-Viewer software controls camera settings.

CAMERA

THANKS TO THE rise of affordable video communications tools such as Connectix's $299 Color QuickCam digital camera and White Pine Software's Enhanced CU-SeeMe software, videoconferencing is now readily available to ordinary computer users via the Internet. The latest product to boost the videoconferencing trend is ACS Innovations' **Compro Digital Color Internet Camera,** priced at only $245. Like the QuickCam, the Compro is a small, 24-bit digital camera capable of capturing video movies and still images at various frame rates and resolutions.

Instead of using internal memory or a video capture card, the Compro camera transfers images directly to your PC via a cable that attaches to a parallel port. Since the camera doesn't have audio capability, you'll have to provide your own microphone to capture sounds. I tested a preproduction version.

The Compro, which is compact enough to place atop a monitor, is easy to set up and use—but it will take you some time to adjust the manual focus and tweak the software controls to obtain the best possible image, especially in low-light conditions. The quarter-screen video setting (160 by 120 pixels) provides the fastest frame rate and least amount of jerkiness for transmitting live digital video on the Internet, but the color quality suffers as a result. Nevertheless, this setting is more than adequate for basic videoconferencing.

You can use the Compro to capture still images at higher-quality resolutions of up to 640 by 480 pixels—though this is not as convenient as using a standard digital still camera because the Compro must remain tethered to your PC. It comes bundled with image viewing and videoconferencing software, as well as with AVI and TWAIN drivers for other applications.

—*Richard Jantz* ▶

Compro Digital Color Internet Camera

PRO: Inexpensive; captures digital movies and still images.

CON: No microphone or viewfinder; mediocre color quality.

VALUE: Affordable Web videoconferencing.

ACS Innovations, Inc.
888/226-6776
http://www.acscompro.com
List price: $245

READER SERVICE NO. 749

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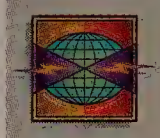
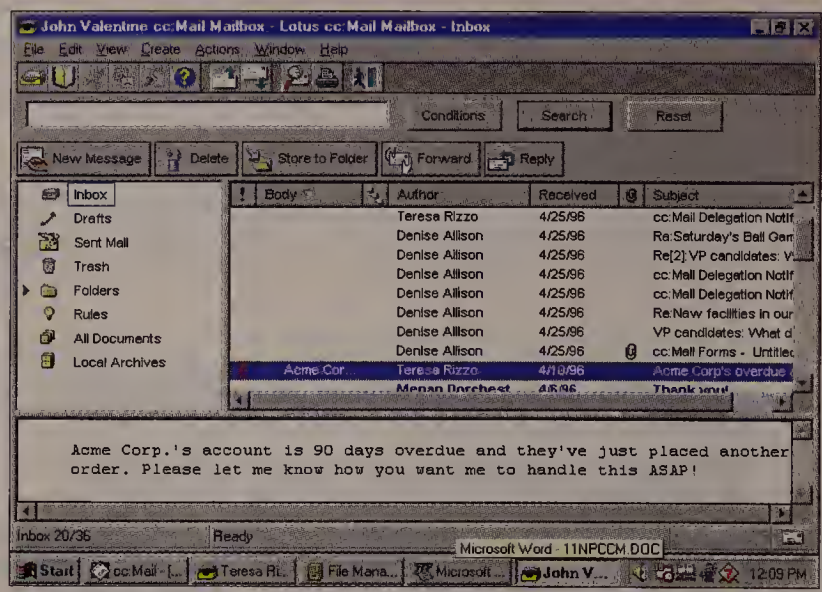


FOR MORE PRODUCT news and the latest announcements, check out the PC World Daily News Service at **http://www.pcworld.com/news.html.**

Lotus cc:Mail Release 7.0 Helps Manage E-Mail

E-MAIL

LOTUS'S LATEST version of **cc:Mail** alleviates one of today's biggest headaches—e-mail overload. My review of a beta copy revealed an impressive assortment of new tools for skimming, sorting, and delegating your way to an empty in-box. Perhaps the best (but not unique) new feature in release 7.0 is Preview Pane, which displays the first paragraph of each message when you click on it. This saves time by letting you see the gist of a message without having to open it. Similar previewing features are also available in Microsoft Outlook 97 (reviewed below) and in Qualcomm's Eudora 3.0. Release 7.0's new sorting options let you organize messages according to subject, author, or other criteria.



SKIM YOUR E-MAIL: cc:Mail 7.0's Preview Pane lets you see the first paragraph of a message without opening it.

If you're going away for a few days and don't want to return to a deluge of e-mail, you can now delegate your mailbox to a coworker who will read and respond to messages. Currently, cc:Mail release 6.0 lets users view only one inbox at a time: To check your inbox, a coworker must log off cc:Mail and log on again with your password.

With the current version of cc:Mail, intense online discussions quickly turn your inbox into a tangle of messages. Companies that often engage in robust e-mail discussions will appreciate the new feature that groups messages with related responses, as in online threads, so that you can easily follow a discussion. This feature was not fully functional in the beta version I saw.

Release 7.0 also sports an improved interface with context-sensitive menus that display different tools, according to the tasks you want to perform. One drawback: The full installation requires a porcine 40MB of disk space.

—Randy Ross

cc:Mail Release 7.0

PRO: Slick tools for managing e-mail overload.

CON: Requires lots of disk space.

VALUE: Could save cc:Mail users lots of time.

Lotus Development Corp.

800/343-5414

http://www.lotus.com

Street price: $55 per user (for 50-user pack)

READER SERVICE NO. 750

The Future Is Bright for Microsoft Outlook 97

SCHEDULER

MOST OF THE things that Microsoft got wrong with Schedule Plus 7.0 and Microsoft Exchange weren't as terrible as they were annoying. **Microsoft Outlook 97,** the Office 97 replacement for Schedule Plus, remedies some of the more vexing oversights, including merging Exchange (the mailbox) with the scheduler. I saw a beta version.

We found Outlook 97 to be a welcome substitute for the awkward Exchange/Schedule Plus partnership. Outlook improves upon several applets that were in Schedule Plus, and it also provides a few new components.

The well-received Schedule Plus interface remains largely intact. But with the addition of Exchange, scheduling is easier: When meeting invitations are dropped onto your calendar, you can use Exchange to accept or reject them, without needing to toggle between the mail and calendar windows. Microsoft has also improved the Schedule Plus address book by adding the Contacts applet. In addition to drag-and-drop support, Contacts finally gets fields for Internet and Web addresses and other useful information lacking in Schedule Plus.

Outlook 97 also includes Notes—electronic "sticky" memos—and the Journal, which helps you track contacts and projects. Unfortunately, Outlook lacks an integrated text editor—a feature that other personal information managers such as Starfish Software's Sidekick provide.

Outlook's tidy interface includes an oversize icon bar and flexible toolbar options. However, the "today" icon in the calendar was hard to spot, and I've yet to discover how to view other user schedules, which was easy to do in Schedule Plus. All in all, though, Outlook is a good alternative for users who need a simple solution for group scheduling that's integrated with a useful PIM. As well as being part of the Office 97 suite, Outlook will sell as a stand-alone upgrade for Schedule Plus.

—Gabrielle Mitchell ▶

Microsoft Outlook 97

PRO: Well-integrated applets.

CON: Could use a text editor.

VALUE: Manageable groupware solution.

Microsoft Corp.

800/426-9400

http://www.microsoft.com

Price: Not set at press time

READER SERVICE NO. 751

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TEXAS INSTRUMENTS

*Only one operating system will be allowed on the Extensa notebooks. When you choose Windows 95 or Windows for Workgroups, the other will automatically be deleted. Extensa and "Start Doing Extraordinary Things" are trademarks of Texas Instruments. Pentium and the Intel Inside logo are registered trademarks of Intel Corp. Microsoft, Windows, and the Windows logo are registered trademarks of Microsoft Corp. © 1996 TI.

Circle 235 on reader service card

Eagle Nest Delivers Low-Cost Backup

STORAGE

IF YOU HAVE more than one PC, backup isn't easy: You must either lay out the bucks for multiple tape drives or deal with hooking and unhooking a parallel port tape drive. (And many parallel-port drives can be slow, although Iomega's Ditto drive, reviewed below, performs admirably.)

Exabyte's **Eagle Nest TR-3** tape drive is a clever solution to the problem. "Nest" neatly describes the device, a frame with electrical connections that you install in a free 5.25-inch drive bay in each PC. You carry the core TR-3 tape drive from PC to PC, slide it into the Nest, and do your backup. I looked at a shipping version.

NESTING INSTINCT: With a Nest installed in every PC, the Exabyte TR-3 tape drive travels effortlessly from system to system.

The TR-3 drive comes with one Nest, a floppy interface cable, and backup software on CD-ROM for Windows 95, Windows 3.1, and DOS. Extra Nests are $49, and an optional $45 accelerator card boosts the data transfer speed to about 20MB per minute. You'll probably want the card, which will let you back up a 1GB drive in about an hour. Without the card, the same process takes closer to four hours.

The Eagle Nest TR-3 works with a wide range of tapes but doesn't include one. If you use the optional data compression, you can cram up to 4.4GB of data onto a TR-3 Travan Extra tape. If your storage needs are more modest, you can use lower-capacity, lower-cost QIC tapes, which hold up to 1.7GB.

The Nests have several pluses. They're easy to install and are engineered well. You won't need to power down your PC, since the tape drive, which weighs about 2 pounds, is hot-swappable. And the full-featured software lets you schedule automatic unattended backups.

Although low-cost devices such as Zip drives are worth considering, if you have more than one PC the Eagle Nest TR-3 might be a better choice. For a small investment, you get a portable backup drive that uses media compatible with other backup systems.

—*Stan Miastkowski*

Exabyte Eagle Nest TR-3

PRO: No-hassle backup for multiple computers.

CON: No tapes come with unit.

VALUE: The more PCs you have, the better the value.

Exabyte Corp.

800/392-2983

http://www.exabyte.com

Street price: $199; extra Nests, $49; accelerator card, $45

READER SERVICE NO. 752

QUICK TAKES

File It

Off-site storage is coming to home offices and small businesses. SafetyPosit gives Internet service providers tools that allow backup, encryption, and storage of critical files via the Internet. ISPs set the price and pay a 10 percent royalty to Software Partners. Suggested end-user pricing ranges from $9.95 per month for a 10MB vault to $395 per month for a 1GB vault. Software Partners, 800/828-5830; http://www.softwarepartners.com.

READER SERVICE NO. 754

Iomega Creates Ditto Drive for Dummies

STORAGE

AN OLD COMPUTER geek adage says that "It's not a question of whether your hard drive will crash, it's a question of when." After spending a week with a shipping version of Iomega's **Ditto 2GB** tape drive, I found it to be an excellent insurance package. This easy-to-use device makes backing up a hard drive painless even for PC novices.

Setting up this external unit was almost as simple as plugging it into my printer parallel port. My Windows 95 PC detected the drive and prompted me for the supplied drivers. As for my printer, I just plugged it into a parallel port on the Ditto drive. It took some fidgeting at first to get the power and printer cords to stay in, but now I can back up or print without any fuss.

When I booted up the PC after installing the drive, it prompted me for a backup of my entire 1.2GB hard drive. The Ditto can hold as much as 2GB of compressed data (1GB uncompressed) with Iomega's proprietary tapes. (It has read-only capability with the other popular formats such as Travan TR1, TR2, TR3; QIC 80, QIC 3010 and QIC 3020.) It took 1.5 hours to back up about 700MB of files and 1.5 hours to have Ditto double-check them, transferring the data at about 5MB to 6MB per minute, with a compression ratio of 1.2 to 1.

Considering its low price and ease of use, you shouldn't have to decide whether to buy this Ditto drive, just when.

—*Shane Mooney* ▶

Ditto 2GB

PRO: Easy to set up; easier to use.

CON: Must use proprietary tapes to get the most out of it.

VALUE: Wonderful backup product for the technically challenged.

Iomega

800/697-8833

http://www.iomega.com

Street price: $199 external, $149.95 internal, $19.95 for tape

READER SERVICE NO. 753

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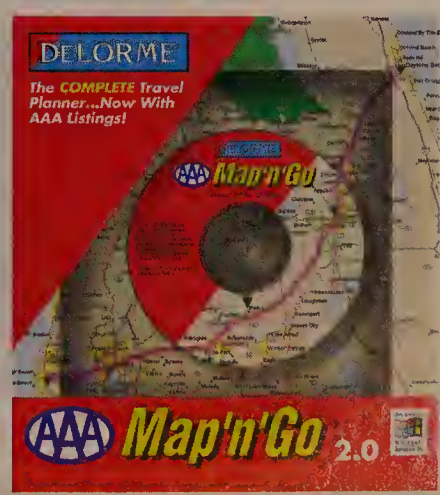

DELORME

Circle 37 on reader service card

HP OmniBook 800: Light, but Not Perfect

NOTEBOOK

HEWLETT-PACKARD'S new **OmniBook 800** is the latest portable PC to straddle the fence between notebook and subnotebook. Like a subnote—known for diminutive dimensions and poor ergonomics—the OmniBook weighs a mere 3.75 pounds. But like a full-size note, the OmniBook features a comfortable keyboard and larger screen. It's far from perfect, but this HP portable does pack enough power to meet today's demanding multimedia applications.

COMPACT, POWERFUL PORTABLE: HP's new OmniBook 800 boasts a spacious keyboard and a large 10.4-inch screen.

On the plus side, the OmniBook's keyboard is spacious, and the notebook's impressive 10.4-inch active-matrix color screen presents a crisp, clear image at resolutions of up to 800 by 600. The machine has an IrDA infrared port and is compact enough to fit on an airline meal tray.

Alas, the OmniBook has its shortcomings. For starters, its pop-out mouse, which connects via a plastic tether, is awkward. The notebook has no internal modem (it accepts two Type II PC Cards). People who travel with the external floppy and optional ($420) CD-ROM drives will have to stuff their bags with a motley mix of peripherals and cables.

Street-priced at $4850, the OmniBook 800 has a Pentium-133 processor, 16MB of RAM, a 1.44GB hard disk, and 16-bit audio. Corporate users will appreciate the optional ($420) docking station. If you need a lightweight yet powerful portable, check it out.

—Jeff Bertolucci

OmniBook 800

PRO: Great keyboard and screen.

CON: Awkward pop-out mouse; lacks modem.

VALUE: You have to make too many concessions for size.

Hewlett-Packard
800/443-1254
http://www.hp.com/go/omnibook
Street price: $4850

READER SERVICE NO. 755

QUICK TAKES

Keep It Quiet

If you work in a noisy office, the omnidirectional pickup pattern of most sound card microphones often results in recordings that are an incomprehensible jumble of sounds. MIDI Land's **Free-D2** microphone solves this problem by using a sensitive high-quality directional condenser element to deliver a high signal-to-noise ratio and great sound. The Free-D2 also includes a flexible 18-inch tube with a stick-on bracket that gives you an unusually high degree of control over microphone placement. List price is $29.95. MIDI Land, 909/592-1168.

READER SERVICE NO. 757

Olympus Ups the Ante on Removable Storage

STORAGE

WHEN YOU THINK removable storage, you probably think of the $199 Iomega Zip drive, which has become the de facto standard for the consumer and SOHO markets. Despite its proprietary storage techniques, it's won a lot of converts due to its low price and ease of use. But watch out for the **Olympus SYS.230.**

MORE FOR YOUR MONEY: Olympus Sys.230 takes on the Zip drive.

Until now, magneto-optical drives have been an expensive choice for power users. Olympus, however, is leveling the playing field: Its new SYS.230 drive retails for $299.

On a point-by-point comparison, the SYS.230 blows the Zip out of the water. In informal tests of a shipping unit, the Olympus drive loaded and ran a large program twice as fast as the Zip. It stored data 15 percent faster and deleted data 5 times faster. Olympus's magneto-optical disc is also more cost-effective than Iomega's proprietary media: A 230MB Olympus MO disc is $10 compared to $18 for a 100MB Zip diskette; this means storage costs of about 4 cents per megabyte for the SYS.230 versus about 18 cents per MB for the Zip drive.

MO media are also more reliable—magnets can't harm your data. The Olympus SYS.230 will read any 3.5-inch 128MB or 230MB MO disc.

There is one downside to the Olympus drive: It requires a SCSI drive for best performance. Olympus has a model that plugs into the parallel port, but it isn't as fast.

—Jeff Sengstack ▶

Olympus SYS.230

PRO: Low price; durable media.

CON: Can only be read by other MO drives; requires a SCSI card.

VALUE: Reliable and affordable.

Olympus Image Systems, Inc.
800/347-4027
http://www.olympusamerica.com
List price: internal SCSI, $299; external SCSI with cable, $359

READER SERVICE NO. 756

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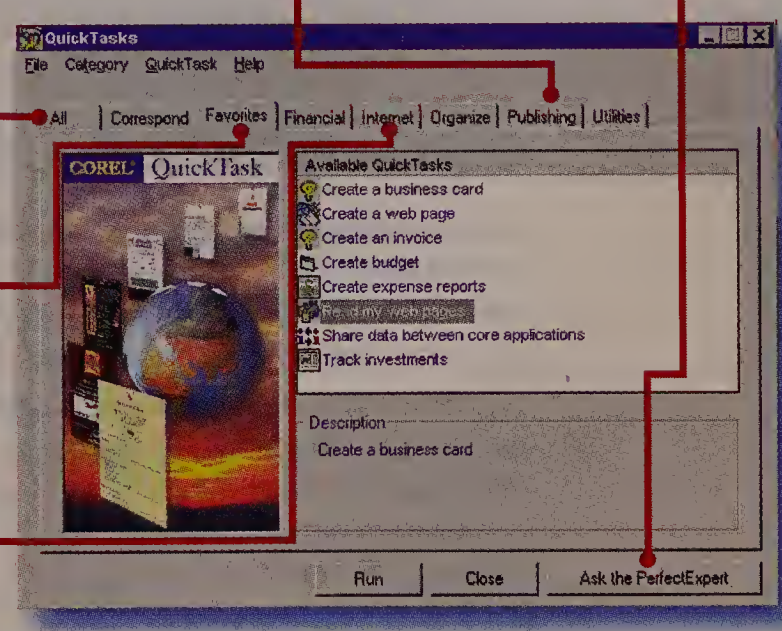

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- Dashboard™ 95
- Envoy™ 7
- 150 fonts
- 10,000 clipart images

† 3.5 inch disks and CD-ROM version also available. CD-ROM drive required to access full set of applications, fonts and clipart. 3.5 inch disks contain Corel® WordPerfect® 7 module.
†† Telecommunication and other charges may apply, depending on usage and location.

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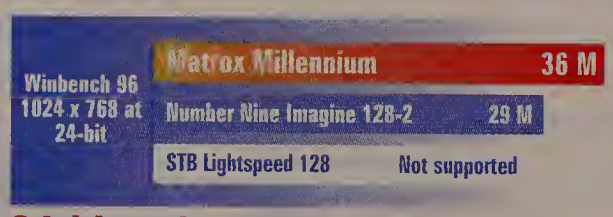

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Matrox Mystique®	55	25	✔	✔
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Diamond Stealth 3D 2000XL	23	14		✔

1-800-362-9352 http:

Matrox Graphics Inc. 1025 St. Regis Blvd. Dorval, Quebec, Canada, H9P 2T4 Tel: 514-969-6320 Fax: 514-969-6363 In Quebec, call 514-969-6330
All Winbench 96 and Direct 3D tests conducted on Sept. 6, 1996 by Matrox Graphics Inc. on a Gateway P5-166 configured with Intel P5-166Mhz, 16MB of EDO RAM with 256K cache. The Matrox Millennium and Number Nine Imagine 128 Series 2 were configured with 4 MB of memory using driver releases 3.12 and 2.09 respectively. The STB Lightspeed 128 was configured with 2.25 MB of memory using driver release 1.22t, and could not be expanded to support 1024 x 768 @ 24-bit. Matrox Mystique, Diamond Stealth 3D 2000XL and ATI 3D XPRESSION were configured with 2 MB of memory for the PCI bus using driver releases 3.12, 4.03.00.2101 and 2.22 respectively for Windows 95. WinBench 96 1.0 tests conducted at 1024 x 768

LY FAST
WS & VIDEO

At work or play

An ideal solution for both the office and home, Matrox Mystique provides outstanding acceleration for general Windows applications, 3D texture mapped games, multimedia CD ROM titles, and DOS games. And unlike many of the competition's 3D *decelerators*, Mystique delivers true 3D game power with the highest frame rates possible and a unique set of 3D features not available with other products.

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✔	✔	✔	✔
	✔		

//www.matrox.com/mga/speed

resolution with 8-bit and 24-bit color at 75Hz refresh using large fonts under Windows 95. ATI has not released Direct 3D drivers for the 3D Xpression therefore drivers provided on the Microsoft DirectX 2.0 SDK were used. © Monster Truck Madness Microsoft Corp. Monster Truck Madness was tested in first person view, with dashboard off, map off, sky texture on, horizon on, smoke effects on, image quality high, texture normal,scenery complex, shadow normal, smoothing on, tire tracks and particles. Test conducted at full screen 640 x 480 @ 16 bit. Direct 3D tests done using Tunnel from the DirectX 2.0 SDK. Diamond Stealth 3D 2000XL and ATI 3D Xpression tests were conducted at 512 x 384 @ 16 bit while Matrox Mystique tests were conducted at 640 x 400 @ 16 bit based on Gouraud shaded, perspective correct textured, point sampled, 16-bit per pixel color, dithered rendered polygons. (1) Game failed when executed on ATI 3D Xpression

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- 2 to 4 MB of fast single ported SGRAM memory
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- Also includes MGA Powerdesk utilities for Windows
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- Bundled with a software MPEG player, 3D web browser plug-in, and three 3D games: Mech Warrior™2, Destruction Derby™2 and Scorched Planet™
- Starting at $179 (ESP 2 MB)

8-bit color

matrox

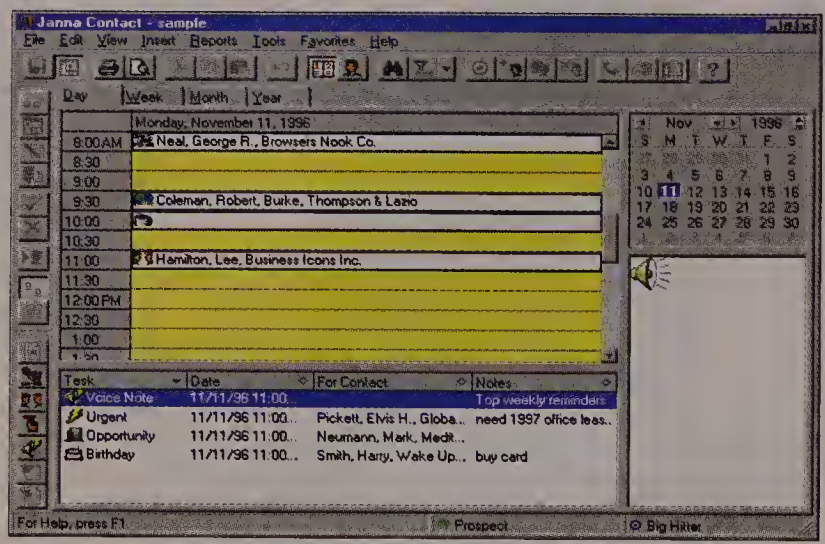
Circle 143 on reader service card

PIM Updates: Ecco Pro 4.0 and Janna Contact

P I M

PERSONAL information managers keep trying to make your life simpler. In the newest versions of **Ecco Pro** and **Janna Contact**, you'll find changes aimed at streamlining interfaces and data entry. Ecco Pro 4.0 is a powerful choice for workgroups, while Janna Contact Personal is a low-cost option for individuals. I saw preproduction copies.

With release 4.0, Ecco Pro becomes a 32-bit application for use with Windows 95 and Windows NT. Raw power and solid workgroup connections vault this PIM ahead of the competition.



ADDED BONUS: We liked the the picture-centric appointment manager in Janna Contact Personal.

The program retains the look and feel of version 3.0, with customizable folder views and notepads that help you organize tasks and appointments using outliner tools. The Calendar and Phonebook folders have a card-file interface.

The most common complaint about Ecco is that it's hard to learn. Version 4.0 simplifies the interface's menu structure. The PIM supports Object Linking and Embedding 2.0 but keeps the popular Shooter tool for quick cut-and-paste operations.

Mobile and remote users can use e-mail to manage and synchronize their Ecco Pro 4.0 schedules. The program supports cc:Mail, Exchange, Notes, and NetManage's own Z-Mail client. Overall, Ecco Pro 4.0 makes a solid workgroup PIM.

NetManage will also be releasing Ecco Share, an enterprise version. Ecco Share's Web scheduling service lets group members set their schedules—or check those of others—using a Web browser. Ecco Share users can share their data across several servers and platforms—even with UNIX and Macintosh workgroups.

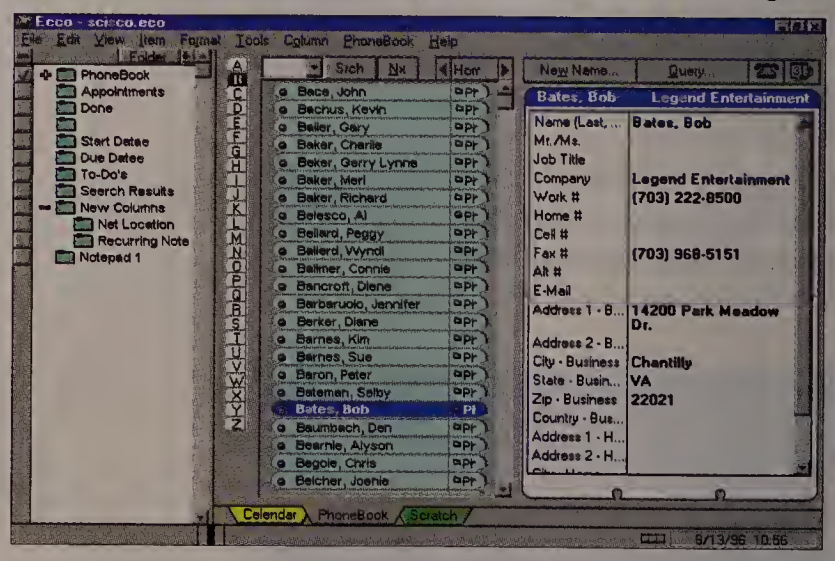
PERSONAL CONTACT

JANNA CONTACT PERSONAL is a simpler version of Janna Contact 95. It competes with basic PIMs such as Starfish Sidekick, though the interface is a bit more complex.

Janna Contact Personal displays contacts and tasks on a single screen for quick access. You can resize any of the windows (contact list, contact details, tasks, notes) as you wish. Use the toolbar buttons to sort items, toggle to the appointment calendar, or filter contacts by specific criteria.

While it clearly stands in the PIM category, Janna Contact Personal (like Symantec's Act) focuses on information for turning contacts into sales. You can store all kinds of information right with your contacts—for example, sales reports, photos, voice recordings, or video clips. Janna Contact Personal makes good use of the right mouse button for linking appointments and tasks to contacts. This PIM is inexpensive enough that you can try its organizational approach without much risk.

—*Peter Scisco* ▶



YOU'VE GOT TO KNOW WHEN TO FOLDER 'EM when you want to get the most from Ecco Pro 4.0's organizing power.

QUICK TAKES

Net Some Contacts

If Willy Loman had automated his work with a contact manager like Maximizer Enterprise 3.0, *Death of a Salesman* might have been a lighthearted Broadway musical. Well suited for sales forces, this workgroup-savvy version of the popular personal information manager does everything from rating sales opportunities to creating lead searches from information gleaned from the Web. The list price is $600; a personal version retails for $99.95. Maximizer Technologies, 800/804-6299; http://www.maximizer.com.

READER SERVICE NO. 760

Ecco Pro 4.0

PRO: Flexible, powerful; individual and workgroup features.

CON: Interface has a learning curve.

VALUE: Excellent choice for organizing lots of material.

NetManage
206/885-4272
http://www.netmanage.com
Street price: $99

READER SERVICE NO. 758

Janna Contact Personal

PRO: Fairly simple interface, low price.

CON: Demanding users will need more functionality.

VALUE: Worth a try if you dislike Organizer and Sidekick.

Janna Systems
800/268-6107
http://www.janna.com
Street price: $49

READER SERVICE NO. 759

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Now

"Hey dad, how's it going?"

Be Half Way

"Just checking in. What's new at home?"

"Oh not much. Just this!"

Around The World

And Still See

(gasp!)

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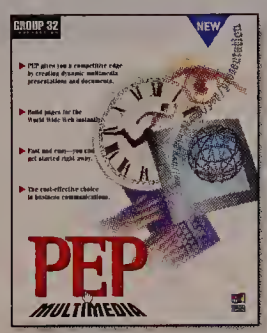

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HP's Inexpensive Home Color Printer

PRINTER

HEWLETT-PACKARD'S $199 **DeskJet 400**, the company's lowest-priced color ink jet printer to date, is an affordable option for home projects. Its speed and print quality are not good enough for business jobs or take-home work, but at this price, you can buy your kids their own printer.

The shoebox-size DeskJet 400 can fit on small desks and sets up easily, in about 10 minutes. It replaces the HP DeskJet 600 and 600C printers, and it offers 600-by-300-dots-per-inch monochrome printing and 300-dpi color printing. You can print 3 monochrome pages per minute, which is a little below average (most competing products offer 4 ppm in monochrome)—but you will have to wait a whopping 4 to 7 minutes for one color page.

BUT IT'S CHEAP: The DeskJet 400 takes a whopping 4 to 7 minutes to print one color page.

Another inconvenience: Whenever you want to print in color, you must swap the black cartridge out for a color one. (HP's $300 color ink jets hold both cartridges at once.) And the paper tray holds only 50 sheets.

In *PC World*'s battery of printer tests using spreadsheets, multicolored text, documents inlaid with color photos, and complex, multipage presentations, a shipping DeskJet 400 unit ranked at just above average speed. Because it prints at 300 dpi, significantly lower than the typical 600-dpi resolution, the color documents, while acceptable, were a little washed out, and photographs had a grainy look. With black-and-white documents, text looked only average, while monochrome images suffered from slight banding.

—*Shane Mooney* ▶

HP DeskJet 400

PRO: Compact, low price.

CON: Inconvenient design, so-so image and text quality.

VALUE: For very tight budgets.

Hewlett-Packard Company

800/752-0900

http://www.hp.com

Street price: $199

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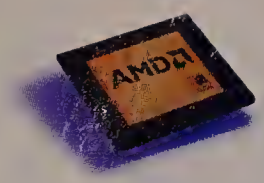


With the AMD-K5™-PR133 processor, CyberMax provides its customers a viable alternative: the freedom to choose a Microsoft® Windows® & Pentium-compatible processor solution that offers superior value. The AMD-K5-PR133 processor delivers equivalent performance of a 133-MHz Pentium (chart below), making it the *best* performance value for today's desktop PC users.

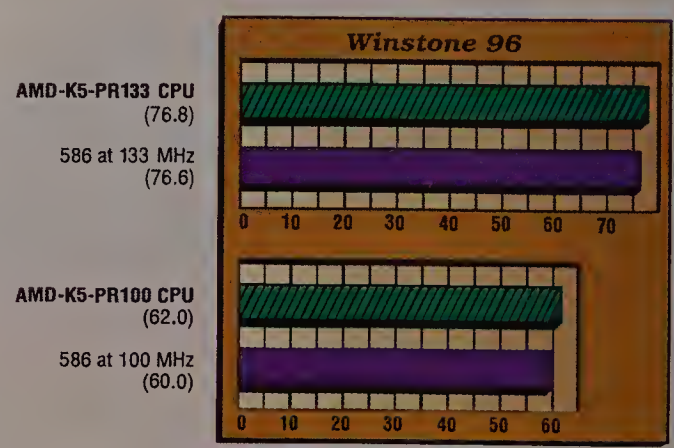
Looking for Value?

MAX *can* DO IT!

Computing takes on a whole new dimension with systems powered by the AMD K5-PR133 processor. AMD has cleverly designed processors with pinout compatibility for future 586- class PC upgrades; and the AMD K5 processor is compatible by design with the growing base of x86 and Windows compatible software. The AMD-K5-PR133 processor clearly delivers the best value for home productivity, Web connectivity and entertainment.

AMD

The P-Rating of an AMD-K5 processor is determined in an "apples to apples" system-level comparison. PC system manufacturers utilize this methodology, for consistent, objective rates on Pentium-relative performance for Windows applications. And the P-Rating helps end users understand true processor performance equivalences while making their PC buying decisions. For example, if an AMD-K5 processor offers the equivalent performance of a 100-MHz Pentium, it receives a P-Rating of "PR100".



The results are in! The AMD-K5 CPU series outperformed its 586 processor opponents in recent Winstone 96 testing.

Max A10-PR133 $1949

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AMD K5-PR100.....$1499

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- 15" Princeton Graphics *EO* 28dp (13.8" VA) NI Color Monitor
- 104-Key keyboard, Microsoft® PS/2 Mouse
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AMD K5-PR133.....$1449

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Hewlett Packard Deskjet 680C Color Printer.....Add $379

Standard on all systems: 2 high speed serial (16,550), 1 parallel (bi-directional) and 1 game port

The Family Office Multimedia CD Bundle

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(Pre-installed w/CD back-ups)

STB Systems, Inc.

CyberMax's AMD K5-PR133 processor-based systems now feature the brilliant video of STB's VELOCITY 3D Windows and Multimedia Accelerator. This video graphics card supports full Microsoft Direct 3D, Z buffer and Bilinear textures, and can handle resolutions up to 1600 x 1200 x 65K colors. It even racked up an impressive 46 million WinMarks in the latest lab tests. *Experience the VELOCITY 3D difference!*

COMPUTER SHOPPER **April 1996**

"...CyberMax computer may be the multimedia PC equivalent of striking gold."

PC WORLD **Aug 1996**

"The (STB 128bit) LightSpeed posted the highest PC WorldBench graphics score of any board we have tested."

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In the eight years CyberMax has been in the computer business, we've learned what it takes to build a system that bears the marks of quality and reliability.

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HP Boosts LaserJet Speed, Bundles Navigator

PRINTER

HEWLETT-PACKARD has just boosted its low-end LaserJet aimed at small businesses and home offices. Not only does the **LaserJet 5L Xtra** have improved printing speeds, but HP has bundled a collection of productivity applications and a copy of Netscape Navigator Personal Edition 2.0 as well.

The 5L Xtra includes many of the 5L's features at the same $479 list price. The 600-by-600-dots-per-inch 5L Xtra retains 1MB of memory and utilizes HP's Resolution Enhancement technology and PrintSmart software. The Xtra features an economy mode that lets you print draft copies with 50 percent less toner, and its no-wait fuser technology reduces first-page-out time.

But the new model diverges from the old in print speed. Although rated, like the 5L, at 4 pages per minute, in our tests the 5L Xtra outperformed the 5L, almost halving its output times in many cases. A simple 5-page Excel 7 spreadsheet took 192 seconds to print on the 5L, but only 83 seconds on the 5L Xtra. Since the two models have no hardware differences, the 5L Xtra's speed advantage appears to be due to new drivers. Most of the Xtra's print times were comparable to the more expensive HP LaserJet 5P, which has a 6-ppm engine. Still, the 5L Xtra predictably lagged behind its 8-ppm competitors, with times twice those of the NEC SuperScript 860 (which is priced the same) and the Okidata OL810e. We noticed no print quality difference between the 5L, which topped other printers in almost every category, and the Xtra.

In addition to Navigator, the disc includes Avery LabelPro 2.0, Family Health Tracker, Greetings for Windows, Bitstream TrueType fonts, and HP's Personal Information Manager. To aid printer setup, the CD-ROM includes a video that demonstrates the 5L Xtra's features and shows a walk-through of software installation.

The 5L Xtra's increased speed, along with the included software, makes it the perfect low-cost laser printer for a home office that is just getting off the ground.

—Mark Glaser ▶

LaserJet 5L Xtra

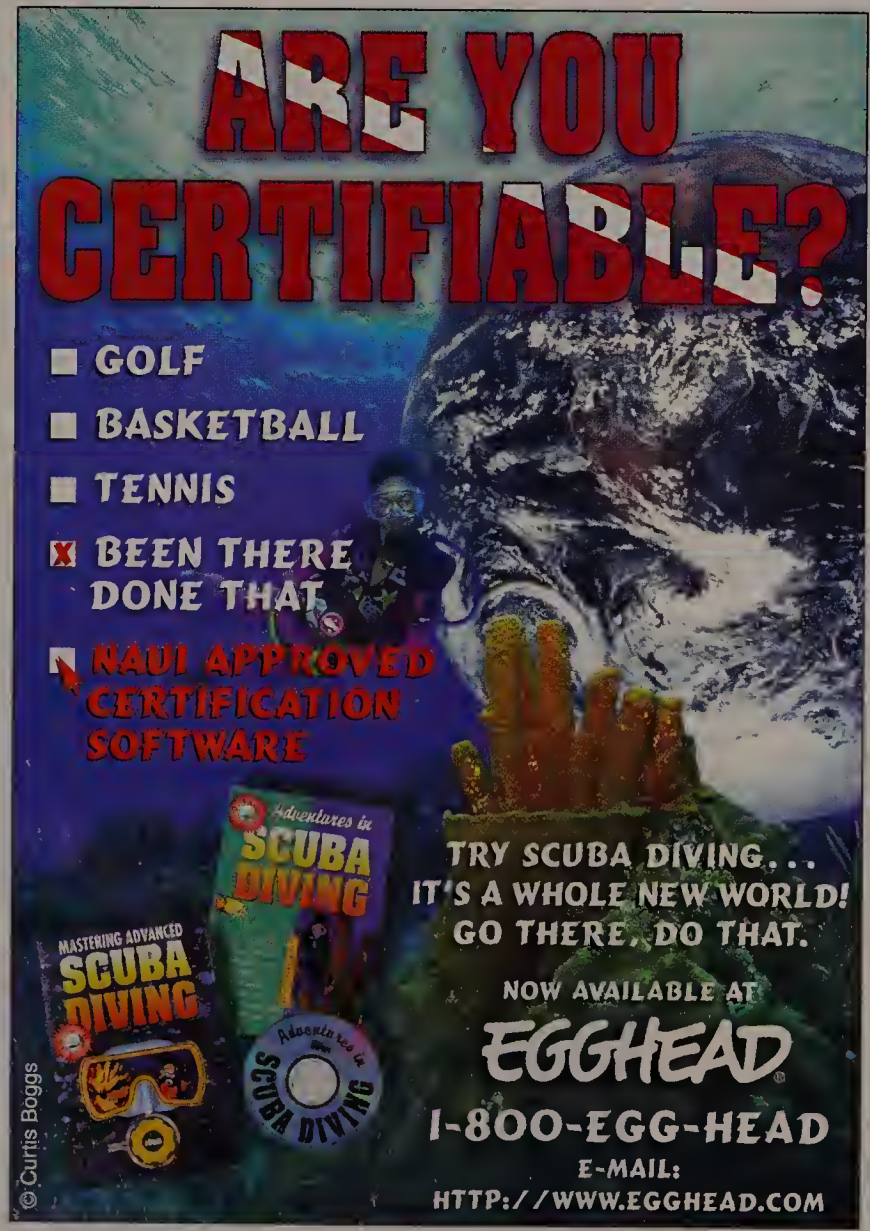
PRO: Improved print speeds; bundled software.

CON: Still prints at 4 ppm.

VALUE: Buy it if you're just starting a home business.

Hewlett-Packard Company
800/752-0900
http://www.hp.com
List price: $479

READER SERVICE NO. 793



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PC WORLD

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U.S.Robotics

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Microsoft Windows NT Workstation 4.0

has the ease of
It has the power

It ha

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Windows 95.
of Windows NT.

omputers everywhere drooling.

The new Windows NT® Workstation 4.0 operating system has been designed to be the most powerful desktop operating system. And because all that power is controlled by the Windows® 95 interface, it's much easier to use. The total 32-bit power of Windows NT Workstation means reliability, security, and easy access to the Internet and tranet. It's reliable because all applications run in their own memory space — so that new game beta won't crash last week's work. It's secure because integrated features let you lock your system all the way down to the file level, so you can count on applications and data being safe. It's Internet-ready because it's loaded with built-in features like TCP/IP, the Microsoft Internet Explorer browser, and integrated Peer Web Services, which lets you create a small intranet for your workgroup. And because it's all controlled by the Windows 95 interface, you can customize your system to work and look however you like. So does all this mean Windows 95 is history? Absolutely not. Windows 95 may still be your best choice, depending on your existing hardware and applications. We suggest you dive headfirst into our Web site to compare and contrast operating systems to see which 32-bit desktop is best for you.

Microsoft®

Where do you want to go today?™ www.microsoft.com/ntworkstation/

Picture This: Fractal's Draw Program Paints

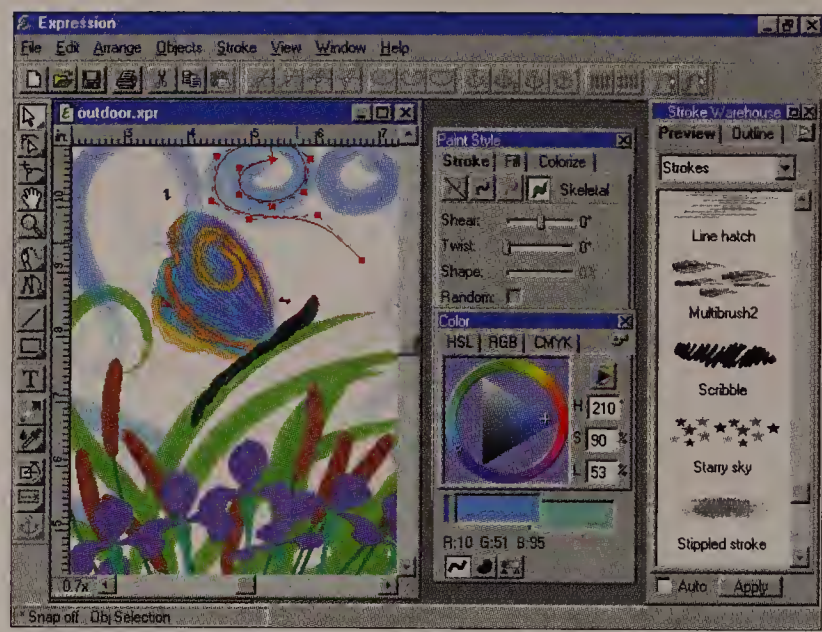
GRAPHICS

IS THERE ROOM for a new Windows drawing program when we already have excellent choices such as CorelDraw, Adobe Illustrator, and Macromedia FreeHand? The answer is "yes" when the program is **Expression**, an innovative graphic illustration package from Fractal Design.

Expression combines traditional vector-based drawing techniques, such as Bezier curve editing, with its own unique tools that let you produce a painted look.

Unlike a paint program, Expression treats each element you add to the canvas as a separate object, one that is fully editable at all times. For example, with a paint program's tools you can simulate graffiti on a wall, but the result is often a bit-map image that's hard to edit, and you end up completely redoing it. With Expression, however, you can create graffiti art and then easily edit each individual object, changing its stroke thickness, fill pattern, and color.

Expression's innovative toolbox includes more than 350 built-in brushstrokes. Some strokes include individual graphic elements, such as a starry sky; this creates the unusual effect of drawing an object or an area with clip art.



WITH UNIQUE TOOLS such as its Stroke Warehouse and its Paint Style palette, Expression lets you produce paintlike effects.

Like CorelDraw and other professional-level illustration packages, Expression is a powerful and often complex program, intended more for experienced artists and designers than for graphics novices. Expression takes as much time to learn and master as other top-notch drawing programs do. But it is a excellent choice for graphic artists.

—*Richard Jantz*

Expression

PRO: Versatile drawing tools.

CON: Complex interface and tools.

VALUE: A pretty picture all around.

Fractal Design

800/846-0111

http://www.fractal.com/

List price: $449

READER SERVICE NO. 794

QUICK TAKES

Clever Calculations

This software for advanced number crunchers has long been popular among the Greek-alphabet set, but with the latest release its developers hope to broaden Mathematica's appeal beyond pocket-protector types. **Mathematica 3.0** lets you customize its interface so it works the way you do. It has enhanced how it looks at input so it can make intelligent decisions about what you want without a lot of explanation from you. And it has a built-in typesetting system so all those pesky symbols used in mathematics—integral, square root, and 700 or so others—will appear on your display and print out as they would if you wrote them on a quad pad. Price may put off some would-be users, though: Mathematica 3.0 retails for $1295. Wolfram Research; 217/398-0700, 800/441-6284, http://www.wolfram.com.

READER SERVICE NO. 796

PC Maintenance Stop for Web Travelers

UTILITY

WOULD YOU PAY about a dollar a week to ensure that your PC is virus-free and running smoothly? If so, consider subscribing to **TuneUp.com**, the first Internet service to provide online PC preventive maintenance. For $3.95 a month, you can log on to its Web site (http://www.tuneup.com), download the latest antivirus software, install it on your hard drive, and have an espresso while it checks under your PC's hood for viruses.

TuneUp.com subscribers can download Symantec's PC TuneUp (which features Norton AntiVirus and Norton Utilities for Windows 95), updated printer drivers, and other software, as well as access TuneUp's staff for expert online help. There's no limit to your visits—daily, weekly, or monthly. Other services, such as online data backup and storage, are available for an additional charge.

I visited the site while it was still under construction. The diagnosis for my PC was good: It was virus-free. TuneUp did find efficiency problems on my hard disk which it fixed.

TuneUp.com's commitment to provide monthly virus protection updates could be its most sought-after feature. Most antivirus packages do not provide updates this frequently. Just about anyone who downloads files from the Internet is a prime candidate for regular antivirus checkups.

—*Richard Jantz* ▶

TuneUp.com

PRO: Monthly virus protection updates; maximizes hard drive space.

CON: Nothing worth mentioning.

VALUE: Useful service costs less than lunch.

TuneUp.com, Inc.

415/691-9411

http://www.tuneup.com

Subscription price: $3.95 per month

READER SERVICE NO. 795

Have These Five Common Windows® 95 Problems Stopped You?

NOW FROM QUARTERDECK™

FREE TRIAL

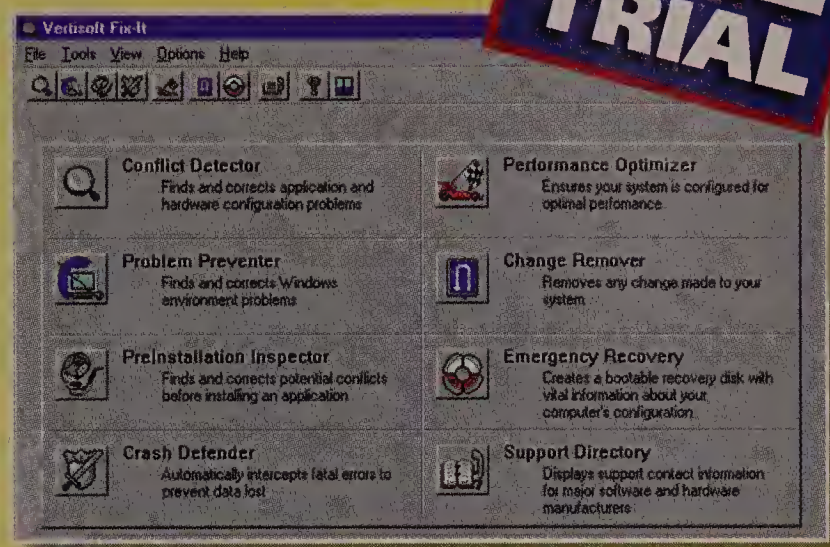
1 The mysterious program crash. *Your system doesn't crash completely, but you still lose your data.*

2 The unresolved software conflict. *You install a new graphics program. It replaces your video configuration with one for Windows 3.1. No more video.*

3 The semi-botched installation. *Your new app installs perfectly. But when you try to run it, you see a "Missing DLL" message.*

4 Plug & Play... Not! *You've installed new hardware, but it doesn't work.*

5 The non-disappearing application. *You uninstalled an application properly. But it's still listed in the program menu.*



Fix-It crash-proofs your PC and fixes problems with a click!

Stop Software Conflicts Before They Stop You!

New Vertisoft Fix-It™ automatically finds and fixes thousands of software conflicts and hardware configuration problems before they can crash your system.

Vertisoft Fix-It's sophisticated knowledge-base of over 1,000 Windows 95, 3.1 and DOS applications lets it find and fix whatever's out of whack – like these system stoppers:

- *Missing program files*
- *Incorrect configurations*
- *Conflicts between applications, hardware and Windows 95*
- *Windows system problems*
- *Hardware device problems*

Plus, it's unique Preinstallation Inspector finds and fixes conflicts before you install applications.

Vertisoft Fix-It also watches over your system alerting you to new problems, catching conflicts, and backing up changes made to your system so you can easily remove changes that cause problems. It even automatically intercepts application crashes so you can save your data.

And on-line updates to its knowledge-base make it easy to keep Vertisoft Fix-It up-to-date.

Circle 190 on reader service card

Features	Vertisoft Fix-It	First Aid 95 Deluxe™
Detailed Knowledge-Base of over 1,000 applications	YES	NO
Uses award-winning Remove-It® technology to remove erroneous software or hardware installations	YES	NO
Ensures system registry and configuration file integrity	YES	NO
Integrates with Win 95 device troubleshooters	YES	NO
Complete crash protection for 16 and 32-bit programs	YES	limited

Programs like Norton Utilities™, WinProbe™ and WinCheck It® detect hardware errors only.

TRY Vertisoft Fix-It™ FREE

call 1-800-683-6696

Offer Code: 01300

Call now and we'll rush you Fix-It FREE! Pay only a $7.50 shipping and handling fee. If Fix-It doesn't crash-proof your PC, return it within 30 days and owe nothing more. If you like it, pay only $49.95 – that's $30 off the suggested retail price! Also available at your local retailer.

OFFER EXTENDED UNTIL 12/15/96

http://www.vertisoftsys.com

Vertisoft superior software solutions

Fix-It Stops Your Windows Problems Before They Start... Automatically!

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NeTpower Ships NT Workstations

WORKSTATION

FURTHER strengthening its alliance with Intel, NT workstation vendor NeTpower has refreshed its line of uniprocessor Pentium Pro systems and introduced dual-processor PPro machines for high-end business and technical tasks.

The major enhancements to the uniprocessor **Calisto** line, which first shipped last February, include Intel's 82440FX PCI chip set with accompanying support for ECC memory; a TrueFX graphics card with support for 3-D graphics and 24-bit color; and a lower entry-level price. For $4995, the baseline Calisto includes a single PPro-200 CPU with 256K secondary cache, 32MB EDO ECC RAM, the TrueFX card, a 1GB EIDE hard drive, a 17-inch monitor, an 8X CD-ROM drive, and 10/100 BaseT ethernet.

NeTpower's **Symetra** workstations support two PPro-200 CPUs with 512K secondary cache. The $6695 baseline Symetra includes one PPro CPU, 32MB EDO ECC RAM, the TrueFX graphics card, a 1GB Fast & Wide SCSI hard drive, a 17-inch monitor, an 8X CD-ROM drive, 10/100 BaseT ethernet, and two Universal Serial Bus ports. A second PPro-200 costs $2050.

For decent prices, robust configurations, and interfaces and processors in common with regular Windows PCs, NeTpower's machines deserve consideration by budget-conscious managers, power users, and MIS directors.

—Shane Rau

THE SYMETRA PENTIUM PRO dual-processor NT workstation is aimed at users seeking an alternative to RISC-based UNIX systems.

NeTpower Calisto NT workstation

PRO: Low price for NT system.

CON: EIDE storage subsystem may need upgrading to SCSI.

VALUE: Good NT starting system.

List price: starts at $4995

NeTpower Symetra NT workstation

PRO: Dual processor capability.

CON: $2050 for second Pentium Pro-200.

VALUE: Most attractive to ex-UNIX users.

List price: starts at $6695

NeTpower, Inc.

800/801-0900

http://www.netpower.com

READER SERVICE NO. 797

Browser Add-Ons Are a Mixed Bag

UTILITY

SOFTWARE developers never miss a chance to exploit a niche market, and the Internet is rife with opportunities. Two new utilities, DataViz's **Web Buddy** and Starfish Software's **Internet Utilities**, strive to fill holes left by the popular Web browsers. Web Buddy handles Web site translation, while Internet Utilities attacks the sloppy nature of bookmarks.

Web Buddy is sort of a cyberspace vacuum cleaner. You can use it to suck pages or even whole Web sites from the Internet onto your hard drive. Once on your disk, you can view the pages offline and save connect charges.

Web Buddy can convert your saved Web pages into snappy word-processing documents without losing the fonts, graphics, and overall look of the original Web page. This feature wasn't quite perfected in the beta version I saw, but the developer said its problems would be cleared up when the program's final version is released.

Internet Utilities extends the idea behind Starfish Software's Dashboard product to Internet browsing with the Control Center, which can be placed anywhere on your screen. Using its customizable tabs, you can better organize your bookmarks or favorite Web sites. A usage meter keeps track of your time online. A utility for zipping and unzipping files by dragging and dropping them onto the Control Center's interface may be the coolest feature.

On the other hand, this approach can lead to screen clutter. Sure, the software lets you customize the Control Center's size; but as you hide items to clean it up, you also reduce the program's usefulness because objects out of sight soon become objects out of mind.

Both Web Buddy and Internet Utilities provide some helpful add-on functions to a Web browser. But the problem with niche applications is that a good idea soon becomes a standard feature in a general application.

—John Mello ▶

Web Buddy

PRO: Captures Web pages easily.

CON: Limited need.

VALUE: Easy sharing of Web pages.

DataViz

800/733-0030

http://www.dataviz.com

Street price: $49

READER SERVICE NO. 798

Internet Utilities

PRO: Tracks online time.

CON: Dashboard clutters screen.

VALUE: Better bookmark monitor.

Starfish Software

408/461-5800

http://www.starfishsoftware.com

Street price: $39

READER SERVICE NO. 799

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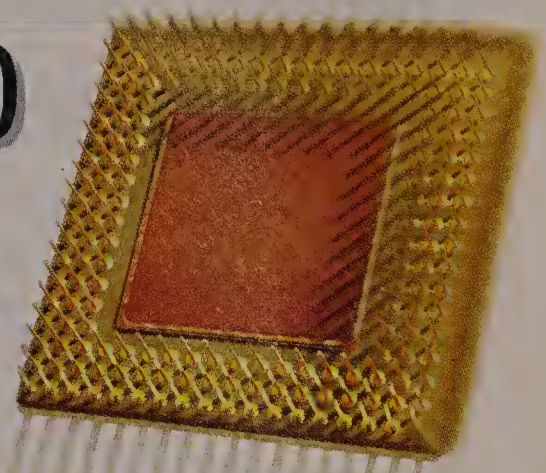
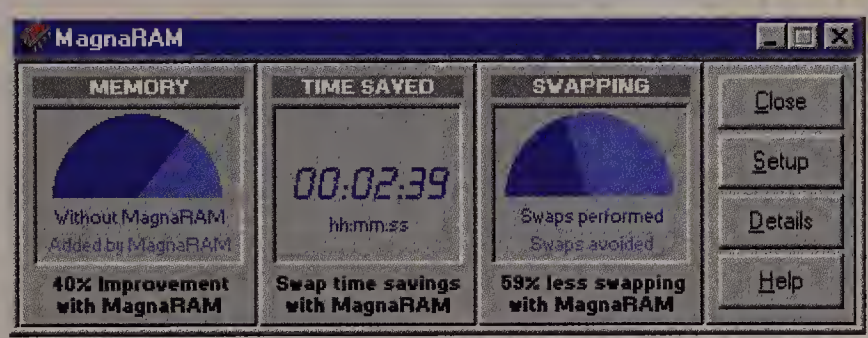
AUTOMATICALLY GET MORE SPEED AND MEMORY. THE ALL-NEW MAGNARAM™ 97 DELIVERS.



Now Run Your System More Efficiently with MagnaRAM 97, the 32-bit Memory Optimizer from Quarterdeck!

Accelerate Windows 95!

Want more speed? You need sophisticated, powerful Windows 95 memory optimization. MagnaRAM works behind the scenes to boost your memory and cut the time it takes to load your 32-bit programs. MagnaRAM's memory compression keeps more data in faster RAM, instead of swapping it out to your hard drive. And when swapping does occur, MagnaRAM stores and retrieves information more quickly than Windows can by itself. You'll get snappier overall performance, and the power you need to blast through your work.



The all-new MagnaRAM 97 control panel displays real-time performance improvements at a glance

EXCLUSIVE

Start Programs Faster with Revolutionary TurboLoad™!

Slash the time it takes to load your 32-bit applications in Windows 95.* MagnaRAM's innovative *TurboLoad* feature monitors the way those 32-bit programs load, and ensures they'll get into memory faster… next time and every time. With TurboLoad, you'll get down to business as quickly as possible.

Get More Memory for Windows!

The top scientists in the field of memory management (the same people who brought you QEMM®) have done it again! MagnaRAM's unique *CacheBack*™ cache management system automatically recovers underused memory from the hard drive cache under Windows 95 and Windows for Workgroups. The upshot? Even more memory to work with! And for Windows 3.1 users, MagnaRAM's memory optimization means more usable memory — and that gives Windows 3.1 extra room for more data and larger programs. MagnaRAM kicks in when Windows runs out of gas — precisely when you need it the most!

MagnaRAM 97 is safe and easy to use. Buy it today, and see what your PC can *really* do.

The more memory you have, the more MAGNARAM 97 can do for you!

Visit your nearest store or call (800) 683-6696 to order.

Ask for code 01055. Check out Quarterdeck's Web Site @ http://www.quarterdeck.com/

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*Results may vary with your application and system configuration.

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For more information, or to read a White Paper on how MagnaRAM 97 can provide you with more speed and memory, just visit our Web Site at http://www.quarterdeck.com/

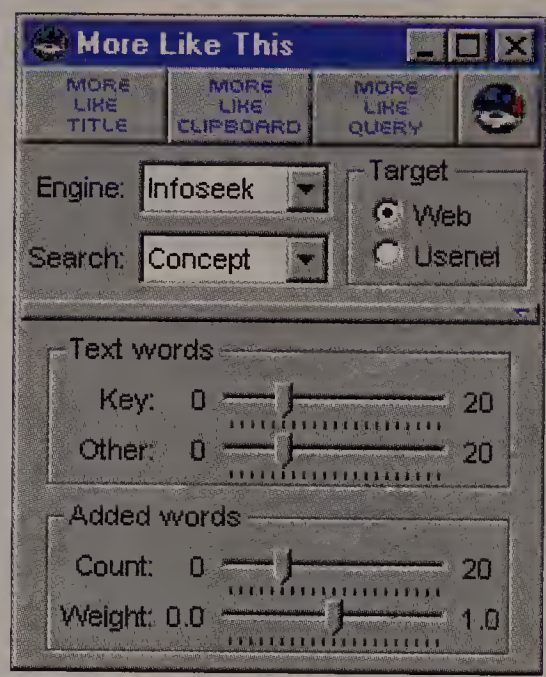
The Hits and Misses of Search Engine Utilities

UTILITY

NOW THAT THE World Wide Web is such a big thing, myriad client-side browser utilities have cropped up—supposedly designed to improve the online experience. But like most software categories, the class of utilities intended to enhance the performance of search engines is populated by both useful and useless products.

Knowledge Discovery Ltd. has hit on something with **More Like This**, an oddly named little program that significantly exceeded our expectations. More Like This operates on the assumption that people think about information searches in different terms than computers do, which is why so many smart queries go unanswered by good infobots. More Like This acts as a translator, adapting the terms and syntax of a query to get maximum results.

The More Like This interface is about the size of a stick of gum, and it's so easy to use that you can keep it minimized and operate it with the right mouse button directly from your Windows 95 tray. In addition to performing simple keyword searches, it handles more complex tasks. "More Like Clipboard" uses text in the Windows clipboard as the query text, allowing you to cut or copy from any Windows document and instantly turn that into a search. "More Like Title" reads the title bar of a Web page you may be looking at, then goes out and searches for similar pages.



MORE LIKE THIS usefully searches the Web by concepts as well as by words.

More Like This

PRO: Translates plain English into search-ese.

CON: Only searches one engine at a time.

VALUE: A search tool you shouldn't be without.

Knowledge Discovery Ltd.

http://www.morelikethis.com/

List price: $35

READER SERVICE NO. 800

EchoSearch

PRO: Um...

CON: Blind downloads, expensive.

VALUE: Not worth your time and effort.

Iconovex

800/943-0292

http://www.iconovex.com/

List price: $49.95

READER SERVICE NO. 801

LESS LIKE MORE

BUT WHERE More Like This succeeds in being a helpful add-on, Iconovex's $49.95 **EchoSearch** fails miserably. After you enter a query, EchoSearch relays it to whichever engines support the particular syntax you used (or whichever engines you specify). Thus, if you enter Boolean terms (AND, OR), EchoSearch links to search pages that handle Boolean queries.

Any decent search tool would return a preview list of possible pages, as a search engine does. Not EchoSearch: Once it finds the number of replies you've specified, EchoSearch proceeds to download every page. The software has no preview mechanism and doesn't flag large downloads. After 20 minutes of thumb-twiddling, EchoSearch interprets the downloaded pages, compiling them into a list for you to browse. Unfortunately, though, the pages are not ranked by relevance, but—get this—alphabetically. Back to the drawing board is too good a destination for EchoSearch. Try the delete key.

—Richard Overton

IBM AntiVirus Offers Internet Immunization

UTILITY

COMPUTER viruses keep coming—more than 8000 at last count, with new ones every month. The popular antivirus utilities are essentially alike. The newest versions, including IBM's **AntiVirus 2.5**, serve as the first line of defense against viruses that attach to e-mail messages and other files you download from an online service or the Internet. (For a look at the McAfee and Symantec products, see October's *New Products*.) At $49, AntiVirus 2.5 is a bargain—it comes with versions for DOS, OS/2, Windows 3.1/95/NT, and Novell Netware in the same package. It also includes protection against those pesky and increasingly common Word and Excel macro viruses. The other notable new feature of AntiVirus 2.5 is complete, integrated Internet protection. It works with all Web browsers and e-mail packages.

AntiVirus 2.5 labors unobtrusively and continuously in the background until it finds a virus. If you're especially cautious, you can also schedule automatic scans of your PC's memory and hard disks. This can be useful since many computer viruses, like organic ones, mutate these days. You can keep up on the latest viruses by downloading free updates to AntiVirus 2.5 from IBM's Web site.

—Stan Miastkowski ▶

AntiVirus 2.5

PRO: Fast, works with multiple operating systems.

CON: No automatic update like Norton AntiVirus 2.0.

VALUE: Great value for the price.

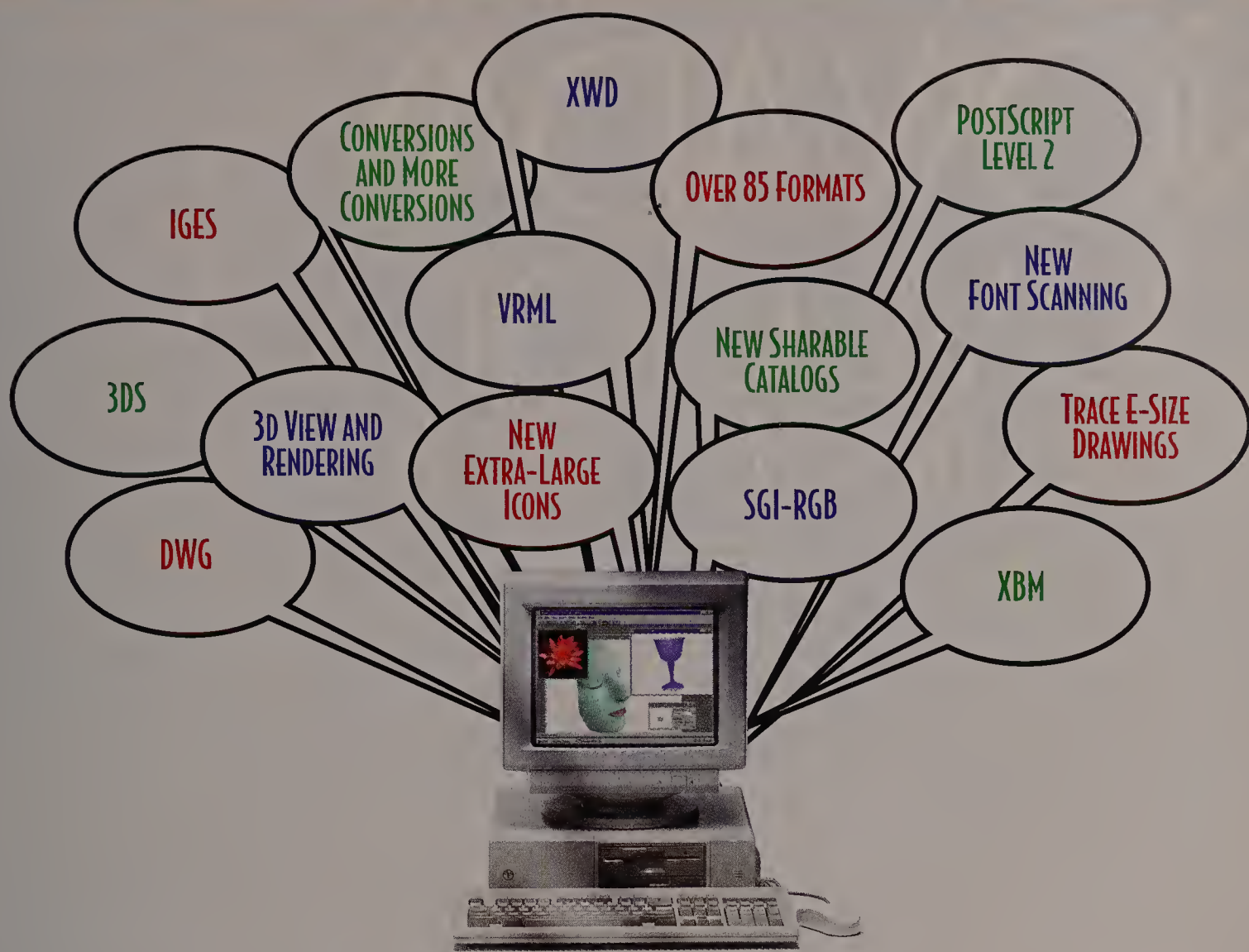
IBM

800/742-2493

http://www.brs.ibm.com/ibmav.html

List price: $49

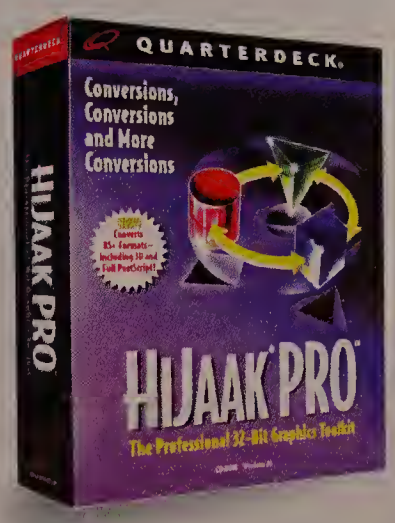
QUARTERDECK®



CONVERT IT WITH HIJAAK® PRO™!

HiJaak PRO 4.0 is the professional 32-bit graphics toolkit for users working with Windows 95. It features top quality, fast image conversion, trace, and screen capture in over 85 raster, vector and metafile formats. It supports graphics view, print, find, enhance, thumbnail, catalog, browse and scan.

HiJaak PRO now also supports full PostScript Level 2 and five of the most common 3D formats: DXF, DWG, IGES, 3DS and VRML. HiJaak PRO makes it easy to accomplish any graphics task by providing shortcut menu access to HiJaak's most common graphics functions. Using HiJaak PRO, engineers can scan, trace, and catalog their legacy blueprints; graphics designers can thumbnail, organize, import, and enhance their clip art and convert incompatible files; and technical writers can take top quality screen captures and import them into any desktop publisher.



View 3D formats with user-selectable Point of View, and render 3D images in wireframe, flat, or gouraud shading. Using *MDI,* HiJaak PRO enables viewing of multiple images simultaneously. With the new font scanning utility feature, fonts that do not automatically register with Windows can be found and utilized. And with new support for extra large icons, you get thumbnails of images which are rich in detail and easy to see in the Windows 95 Explorer.

Call us at 1-800-683-6696 and ask for code 01200, or check out our website at http://www.quarterdeck.com/

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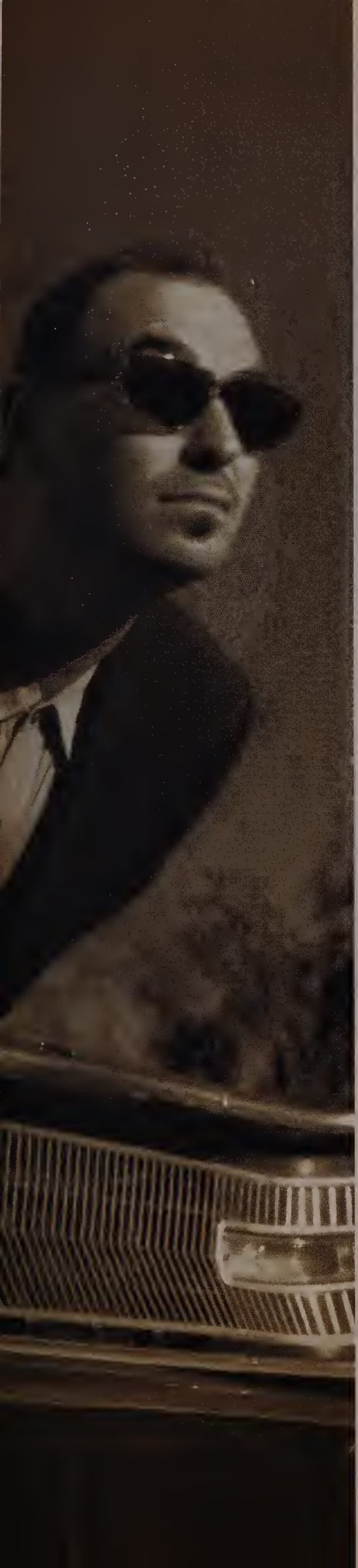

Introducing the

HITACHI E SERIES.

It's pretty clear what the rules are now: 1. If you stand still, you lose. 2. Your office isn't some set place. It's wherever you have to be to do your job. 3. Being away is no excuse for not being on top of it. A daunting state of affairs. Unless you're properly equipped–with Hitachi Mobilized Computing™ technology.

The New Hitachi E Series, powered by an Intel Pentium Processor, up to 133 MHz.

The latest manifestation of the concept is the new Hitachi E Series notebook. Each arrives wired for the world. Since futzing with computers is not what you want to do in the far reaches, our array of communications software comes entirely pre-configured. And the integrated 28.8 U.S. Robotics modem, being an industry standard, connects you glitch-free to anywhere via the Net, online services, or two-way fax.

Meanwhile, we never ask you to sacrifice utility for mobility. The slim E Series case is packed with critical features. The screen is 11.3" and driven by one of today's fastest graphic accelerators for dazzling presentations. The hard drive pops out for security and upgrades. And the floppy drive swaps for a second battery, doubling power duration.

Yet, for all of the above, there is one thing about the new Hitachi E Series that's not out there: The cost. With a price starting at just $1999,* it is a notably excellent value. Thus adhering to standing rule 4, don't blow your money.

There was a time in business when you were expected to drag your way to the top. The idea of Mobilized Computing is to just cruise there.

HITACHI
MOBILIZED COMPUTING™

*Estimated street price. Dealer prices may vary. ©1996 Hitachi PC Corporation (USA). All rights reserved. The Hitachi E Series, Mobilized Computing™ and Remote Control™ are trademarks of Hitachi PC Corporation (USA), which may be registered in some jurisdictions. The Intel Inside Logo & Pentium® are registered trademarks of Intel Corporation. All other marks are owned by their respective companies.

Remote Control™

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United Versus American: Airline Software

TRAVEL

BOOK-IT-YOURSELF software seems like a natural: You do all the work electronically. United Airlines was first carrier to market, with its **United Connection**; then American Airlines introduced **Personal AAcess**. Each program offers a bonus 500 frequent flyer points each time you buy tickets online. (American will stop this benefit at the end of 1996.)

United Connection needs 8MB to 12MB of hard disk space, but packs most of its data online. For this reason, United Connection can't give quick information such as mileage between cities. The form in which you must input flight information is particularly rigid: either airport codes or full city name. You can't mix formats. After a flight is selected, if it's on United, you can check the seating chart for your aircraft and choose a seat.

BULKHEAD, PLEASE: United Connection shows you the layout of the plane, making it easier to find available seats in desirable spots.

The FareShop feature finds the cheapest fare for your itinerary. But you can't print a list of all available flights to a particular destination. Customizing user preferences is a bit tricky, since the menu is called "System Options."

I don't recommend this product. Online data transfers seemed slower than an airport check-in line, and the rigidity of United Connection's functionality was frustrating.

AA'S LIMITED AACCESS

THE LAST THING American Airlines' software provides is access. From its anemic documentation to its lame technical support online and over the phone, Personal AAcess proved consistently inept.

Like United's program, the 10MB AAcess does most of its work with data stored on servers, so it's hard to get information quickly. And requests for the lowest prices were returned with full, not supersaver rates—when the software didn't crash. Houston, we have a problem.

—Michael S. Lasky

United Connection
PRO: Easy to use.
CON: Slow downloads; rigid format.
VALUE: Not worth the time.
United Airlines, Inc.
800/854-2112
http://www.ual.com
Price: $24.95
READER SERVICE NO. 802

Personal AAcess
PRO: None that we can find.
CON: Balky, confusing, inflexible.
VALUE: Not worth a cent.
American Airlines, Inc.
800/222-2377
http://www.americanair.com
Price: $6.95 shipping and handling; must be an AAdvantage member.
READER SERVICE NO. 803

StreetFinder 1997 Edition: A Winner by a Mile

TRAVEL

BUSINESS TRIPS can turn into treks that leave you longing for the days when Mom or Dad drove the car and your only job was to keep sandwich crumbs off the backseat. To avoid travel foul-ups, invest in Rand McNally's **StreetFinder 1997 Edition** CD-ROM.

StreetFinder 1997 has accurate, detailed, and easy-to-print maps. You just input an address and check the map to find your way. Unfortunately, you can't enter two street addresses and ask for point-to-point directions. For disc space reasons, none of the similarly priced mapping CD-ROMs do this yet.

Still, StreetFinder 1997 for Windows 3.1 and 95 is a smart investment. For about $49, you can view current information on hotels, restaurants, and attractions. Extensive business listings (about 1 million of them) in 37 categories let you find the necessities, such as the nearest dry cleaner, barber, or bank with an ATM machine. None of the competing products provide comparable listings.

The new walking guide feature lets you create customized walking directions to your office or other location.

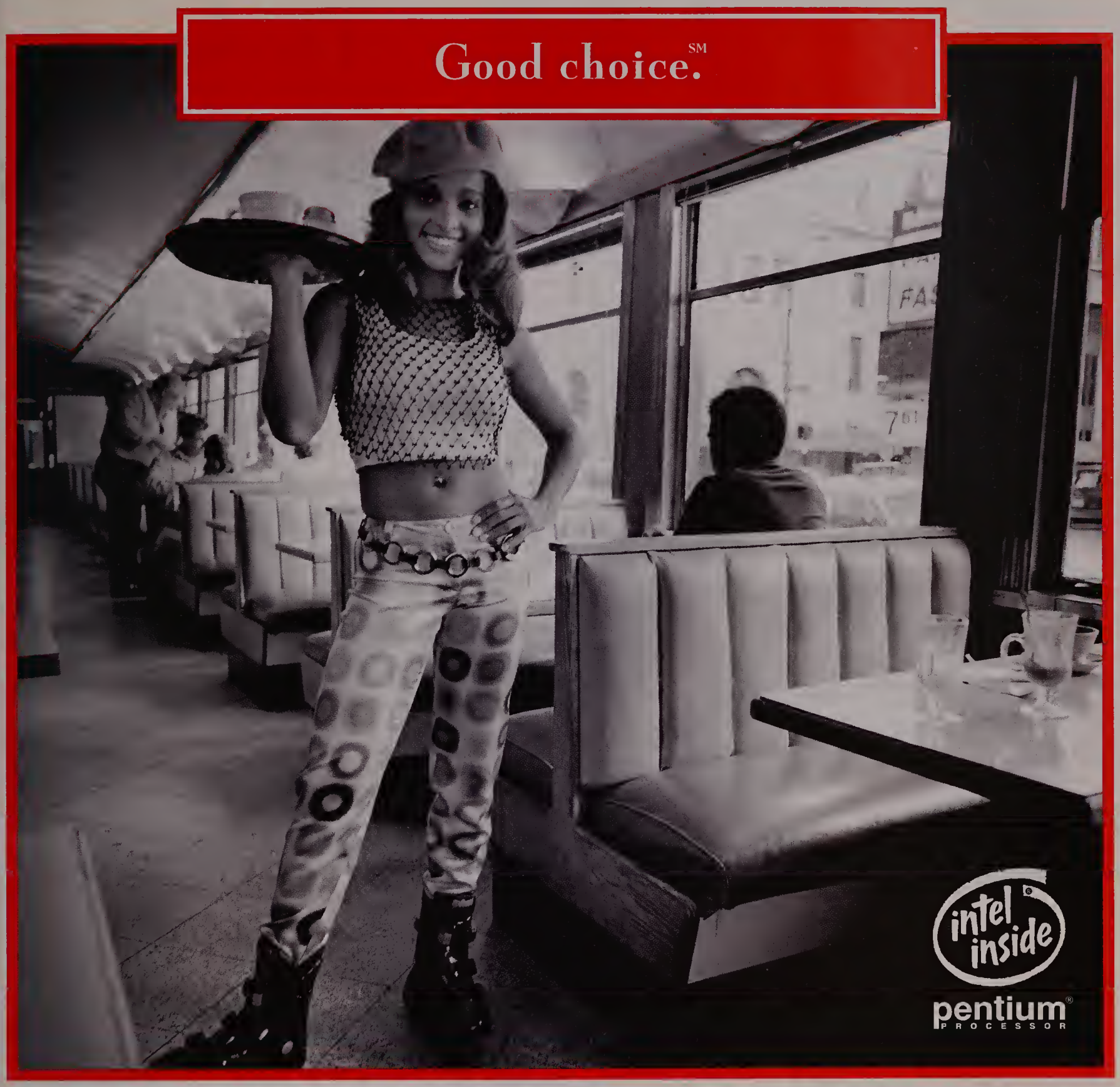
To help keep you current, StreetFinder 1997 incorporates links to the Rand McNally Web site and selected travel sites. At the Rand McNally site, you'll find updates about road construction, weather reports, and notes on seasonal events.

For those occasions when you want to mix recreation with business, StreetFinder 1997 coordinates with Rand McNally's TripMaker 1997, a $39 product for road-trippers that includes details on scenic drives and fun spots such as national parks.

—Laurianne McLaughlin

StreetFinder 1997 Edition
PRO: Gets you uptown, downtown, and out of town easily.
CON: You'll get back to the office in time for the staff meeting.
VALUE: Beats other products by a country mile.
Rand McNally
800/671-5006 ext. 450
http://www.randmcnally.com
Street price: $50
READER SERVICE NO. 804

Good choice.℠



At Phil's Cafe, "Monday's Chef's Special" is the best choice. Now, we know that buying a computer is not quite as simple as choosing Phil's Special. By choosing Quantex, you're choosing a system loaded with the very best components and state-of-the-art technology. We're confident you'll find that Quantex is the right choice.

Stellar performance. At Quantex, we build powerful systems from an incredible range of high-end, brand-name-only components. Choose Quantex and precision performance is yours.

Precise engineering. Every Quantex system is meticulously engineered to work right out of the box. **ISO 9002** certification of our manufacturing facilities is proof of our continued conformance to the strictest of standards. Every system is 100% Novell certified too. Choose Quantex and you choose reliability.

State-of-the-art technology. When there's a dramatic breakthrough in PC technology, Quantex knows about it first. For you, this means staying ahead of the pack. Choose Quantex and take the technology lead. Make the right choice. Give us a call today.

QUANTEX

GOOD CHOICE.℠

Videophoning through my computer? Land Sakes, what'll they think of next?

Let us amaze you with the first Video Phone PC for the home by Quantex. You pick up the telephone and dial your grandson in Seattle. He answers. So far, nothing new. Now, you both boot up your Quantex Video Phone PC with Intel ProShare™ technology which connects your two computers over a standard phone line. Before you can blink twice, his smiling face is displayed in the "Guest Window" on your PC screen. Presto! Simultaneous audio and video. Instant family reunion! An amazing phenomenon to share with your college–bound kids, distant friends, relatives and even your colleagues.

Grandparents enjoying their new Quantex Video Phone PC

Sound like incredible magic? It is. And the magician is Quantex, working side–by–side with Intel to bring you the first Video Phoning available on a home PC! Previously available only to large businesses, Video Phone is now standard fare with the Quantex QP5/VM–1 System. Video and voice over a single, plain old telephone wire. No installation struggles, and meticulously engineered for your Quantex machine to give you true "plug and play" performance. Amazing, don't you agree?

Tune in for Intercast™ technology brought to you by Quantex. With this new technology, not only can you watch TV on your PC, but you can actually interact with the programming through the engaging world of the Internet. Always the technology leader, Quantex adds the sophisticated Intercast experience to our already impressive QP5/VM–1 System making it a complete multimedia package. Integrating the latest technologies into systems is what we do best.

Upgrade specials

- MS Natural Keyboard (Upgrade from the 104-Key Keyboard) . . . $39
- MS Sidewinder 3D Pro Digital Joystick $59
- HP Color Deskjet 680c Printer (Covered by manufacturer's warranty only.) . $319
- Altec Lansing ACS-400 Surround Sound Speakers w/ACS-250 Subwoofer. . . . . $120 (Upgrade from PCs with Altec ACS-40 Speakers)
- Upgrade from 16MB EDO Memory to 32MB EDO Memory . .$99
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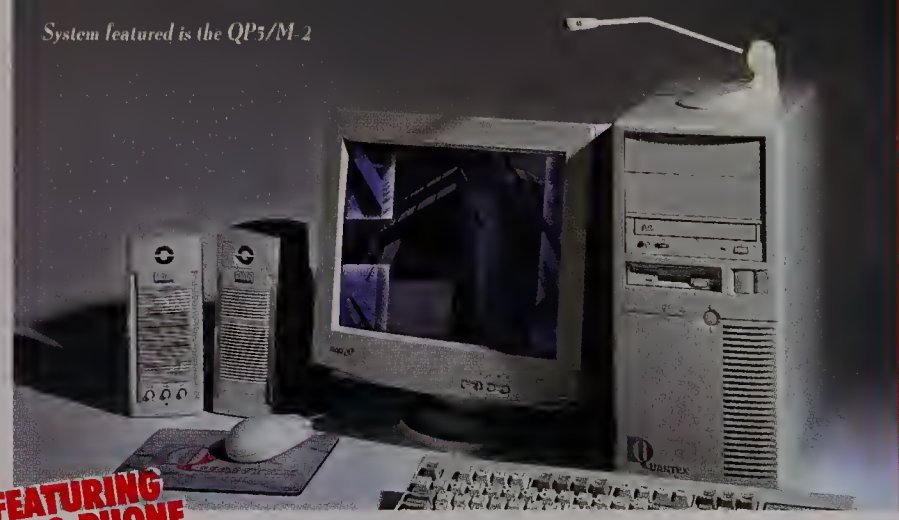

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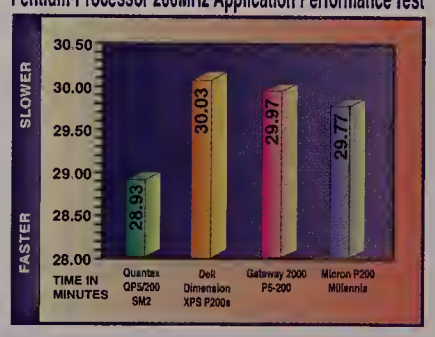

**Based on the combined test times of the following applications: Word 7.0, Excel 7.0, Picture Publisher 6.0, Paradox 5.0, WordPerfect 6.1 and 1-2-3 release 5. Tests conducted by PC World, July, 1996 issue.*

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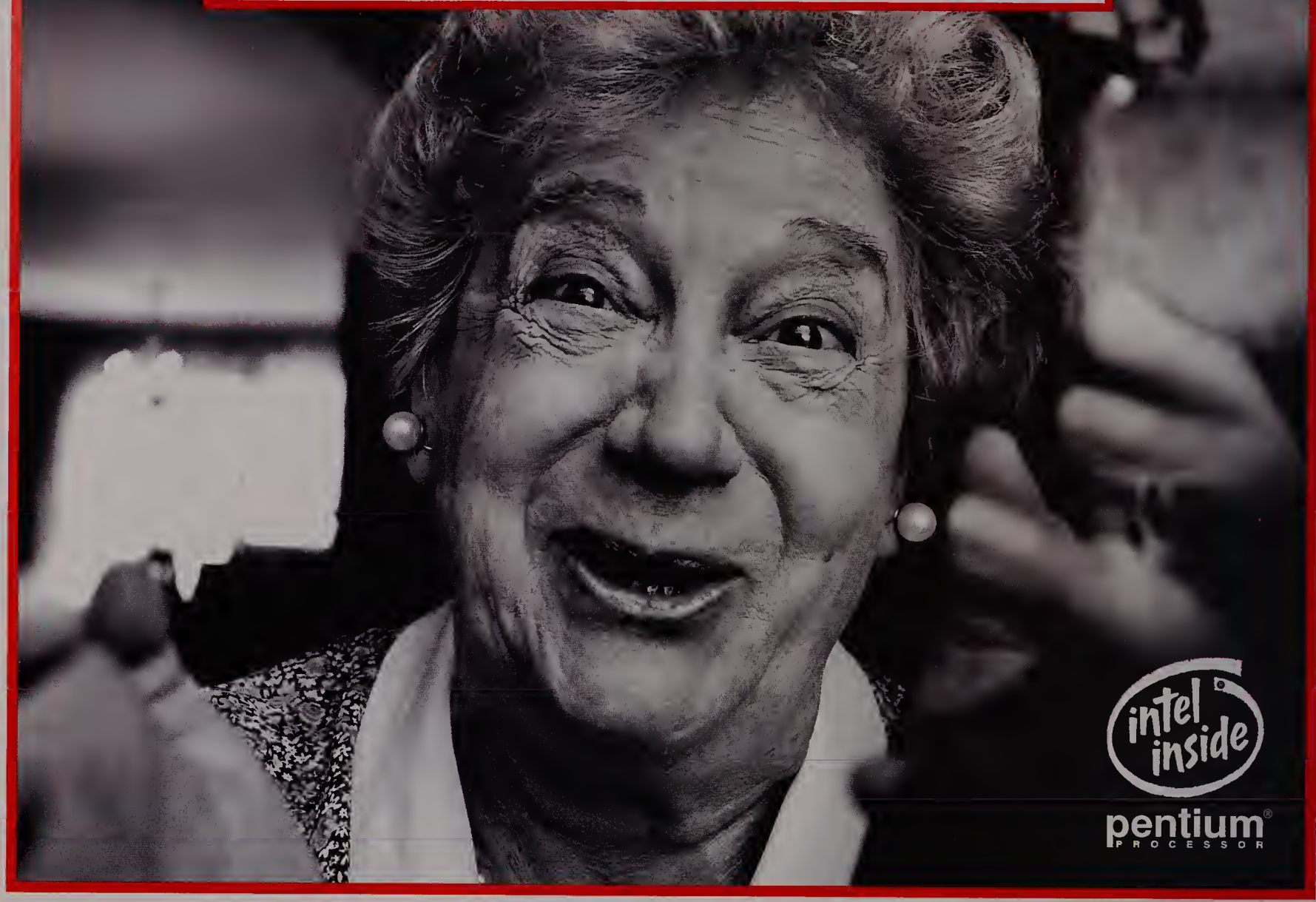

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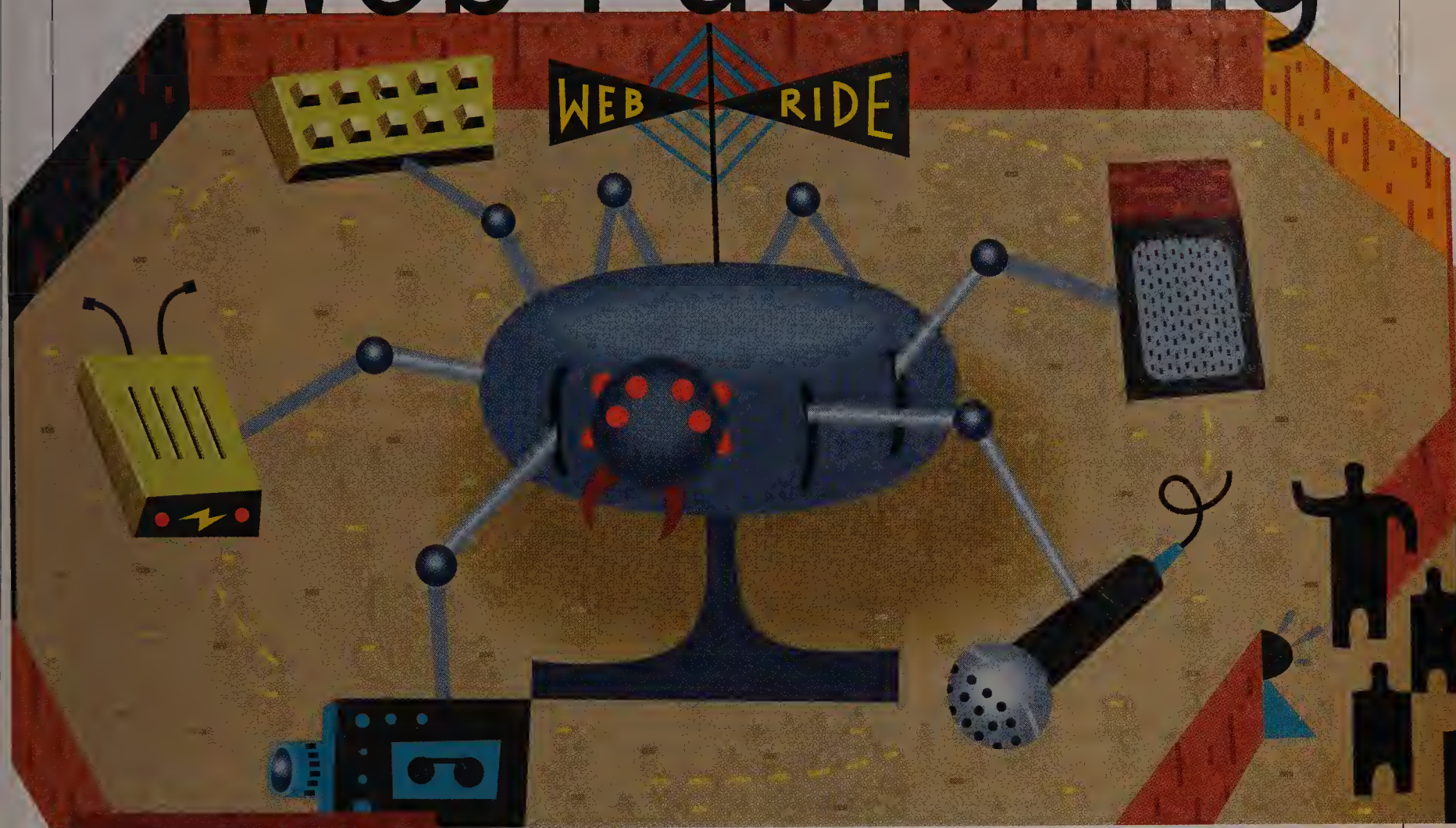

INSIDE

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116 Beyond Web Publishing 101

Also inside:
Tips for setting up your Web site, design do's and don'ts, and resources and tools to check out.

How to set up a great Web site, from finding the right ISP to monitoring traffic and links.

By Yael Li-Ron

ILLUSTRATIONS BY DOUG ROSS

SO IT'S COME TO THIS. You're the only caterer in town without a World Wide Web address on your menu. Maybe you've exhausted all your sales leads and you need to introduce your services to clients around the country. Or maybe you've just had a baby and you want to share photos with relatives all over the world.

It's time you got a Web site. ▶

FORTUNATELY, ANYBODY WITH basic word processing skills can create a Web site, and just about anybody can afford to do so. If you've already got Internet access, chances are you're halfway to being a Web publisher.

But if building a Web page is worth doing, it's worth doing right. You have to evaluate your needs. How lavish do you want your site to be? How often will you update it? Would pictures help get your point across?

And once you've built your site, you need to nurture it. How will visitors find you in that sea of information known as the Internet? And if they do find you, how will you know they visited?

Follow the steps outlined below, and you'll be exploiting the riches of the Web in no time. If you're looking for a robust publishing tool, see our review of Web authoring packages, "Web Software for the Rest of Us," in this issue.

Step 1: Make the Right Connection

BEFORE YOU CAN START publishing on the Web, you need to have Internet access, either through a commercial online service such as America Online, or through an Internet service provider such as Netcom.

Commercial online services let you publish Web pages easily and at no extra cost. America Online and CompuServe offer wizardlike programs that guide you through the process. AOL's version produces cookie-cutter Web pages that all look pretty much alike, while CompuServe's is more flexible. Prodigy offers a robust set of authoring tools to help make your site stand out.

With Internet service providers, you create the site using your own set of tools and then send the finished product to your ISP. But there is a host of questions you should ask when selecting an ISP for this purpose.

Look for a provider that can give you the server space you need. If you have ambitious plans for your site, go with a provider that offers a lot of space. Typically an ISP will give you 1MB to 25MB of space as part of the monthly fee.

TIP: If all you want to do is publish a small, personal Web site, an account with a commercial online service may be all you need.

Also check to make sure your ISP has a high-speed T1 or T3 connection so visitors to your site won't have to wait too long to see your pages. The provider should also support ISDN just in case you and the bulk of the Web-surfing world decide to make that shift.

If you have Web access but don't have your own Internet account, log on to PC World Online and use our ISP Finder (http://www.pcworld.com/nov96/isp.html) to locate a provider in your area. You can also refer to our how-to article on finding the right ISP ("The No-Nonsense Guide to Internet Providers," July). Many online services and national providers offer a free trial period, so take them up on it.

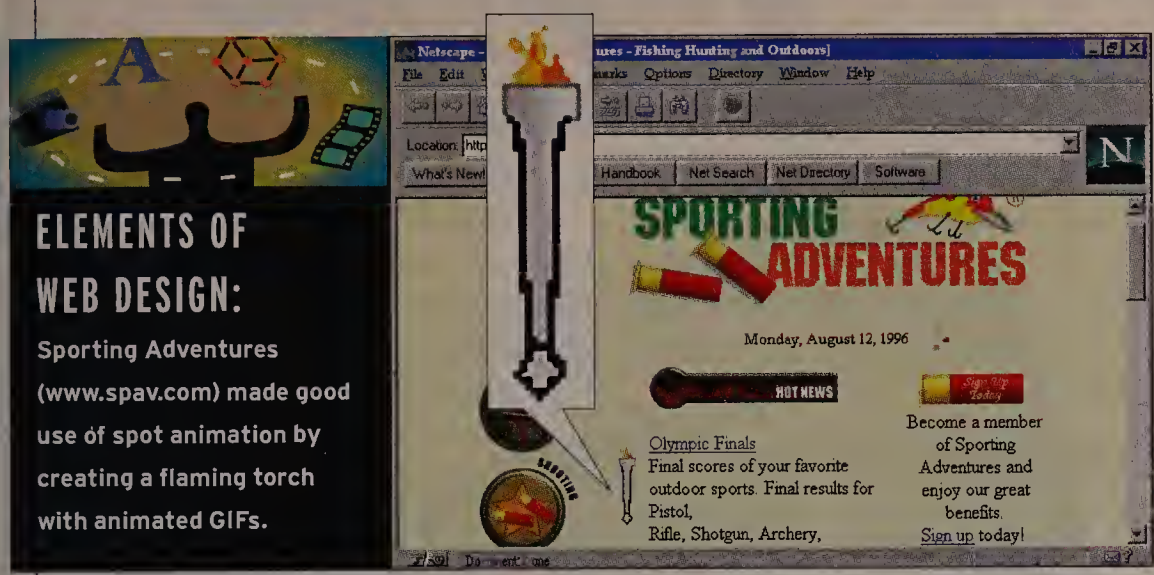
Step 2: Choose the Right Tool

WEB PAGES CAN BE as simple as straight text or as complex as an interactive multimedia game. But at the heart

Ten Web Elements We Love to Hate

NOW THAT ANYBODY AND THEIR SCHNAUZER can have a Web page, there are thousands of truly appalling sites on the Web. Here are the most pain-inflicting Web elements around—use them at your peril.

1. **THE DRAMAMINE EFFECT.** Ticking, blinking, moving, scrolling. These cool new effects are all over the Web. But don't use too many, and don't put them too close together—unless you want to nauseate your visitors.
2. **STILL UNDER CONSTRUCTION AFTER ALL THESE YEARS.** Nothing says "slacker" louder than a perpetual Under Construction sign. If you can, avoid using that notorious yellow icon altogether.
3. **GIVE YOUR LANGUAGE IT'S DO RESPECT.** Not everybody is a writer, but that doesn't mean you should subject your visitors to poor language. Run your Web page through a spelling and grammar checker. When in doubt, have a friend critique your language.
4. **AND THE BANDWIDTH PLAYED ON.** Most Web crawlers use slow connections, 28.8-kbps modems if they're lucky. Don't overload your page with large graphics that take forever to load, or you'll paint yourself into a deserted corner of cyberspace.
5. **http://www.been-there-done-that.com.** By now everybody's seen Yahoo, and they've all visited the White House. If you must have a list o' links, come up with unique ones.
6. **THE BROKEN ARROW.** Check the links on your page as often as you can to make sure they're not "broken." People won't forgive too many instances of 'Error 404: Not Found'.
7. **KEEP IT BRIEF.** If you must post your latest 28,000-word manifesto online, package it in small chunks. Provide links to the different areas of a document on the opening page and let people click their way into it, one portion at a time.
8. **SOMEWHERE ALL OVER THE RAINBOW.** If you're color challenged, conduct an informal beta test: Invite colleagues and friends to look at your slick color scheme (green text on a dark purple background) and gauge their aspirin intake afterwards.
9. **THE FLASHER.** Does the world really need to see pictures of your significant other and your schnauzer? If you're about to expose yourself, set up a warning page telling visitors that by selecting the following link, they'll find out more about you than they need to know.
10. **KILL THE NOISE.** Now that Web pages can play background music, some people think that the surfing experience isn't complete without their favorite rendition of "Louie, Louie" (sung by the significant other and accompanied by the schnauzer). Wrong.



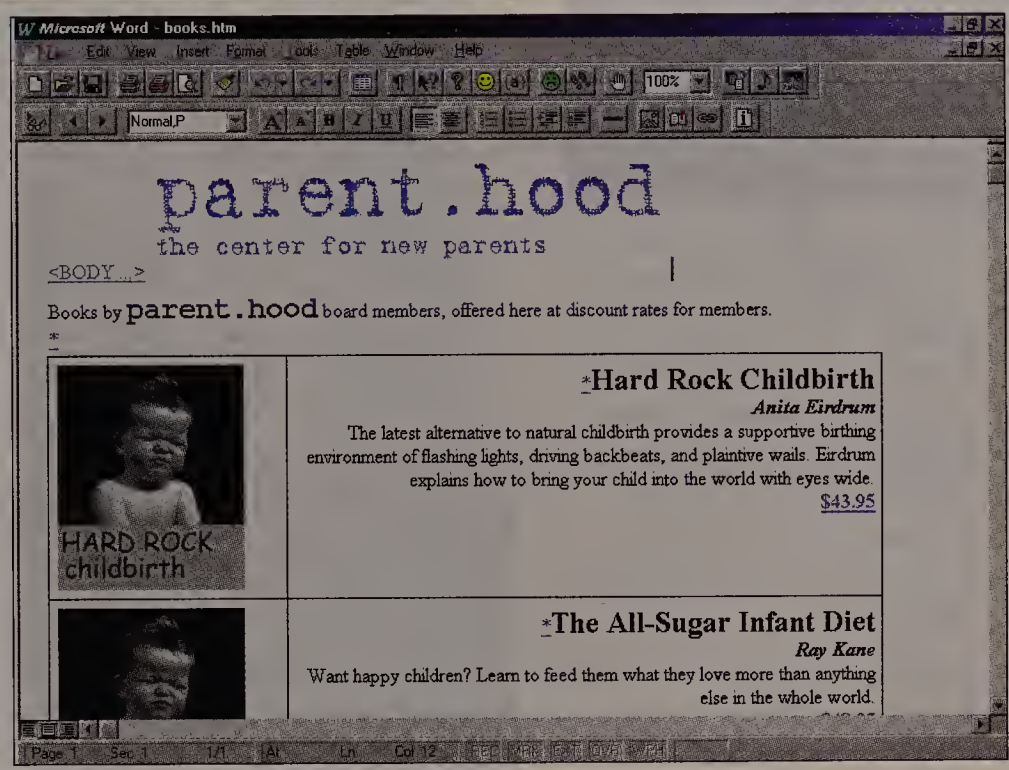
ELEMENTS OF WEB DESIGN: Sporting Adventures (www.spav.com) made good use of spot animation by creating a flaming torch with animated GIFs.

After you've mastered using your word processor as a Web authoring tool, you'll probably want to step up to a full-fledged publishing tool. Programs such as Microsoft's FrontPage and Netscape's Navigator Gold provide you with better flexibility because they support many advanced features. These programs also come with additional tools for posting and managing your Web pages. Many Web authoring packages are available, each with its own pros and cons. For a rundown on which of them may best

of each page on the Web lies a simple foundation called Hypertext Markup Language. Despite its name, HTML is not really a programming language. It's a collection of tags in what is just a text document; the tags tell Web browsers how the text and graphics in your page are supposed to look and act. For instance, `<a href="books.htm">Books</a>` displays the word *Books* with a link to another Web page.

Most of us already have a Web authoring tool that shields us from HTML—it's our word processor. Today, the major Windows 95 word processors (Word 7.0 for Windows 95, Word Pro 96, and Corel WordPerfect 7.0) include add-ins for turning documents into Web pages.

For beginners, word processors and their add-ins make the best Web authoring tools—not because they're especially full-featured, but because they're free and simple to learn. If you use one of



CREATING A WEB PAGE in Word 7.0 (with the Internet assistant add-in) is as easy as creating a document. The difference from regular word processing is in the Save As menu (not shown) and a few unique buttons on the toolbar.

these word processors, you already know how to use its Web tool because the toolbars and menus are nearly identical. Just create a document in your word processor the way you normally do, keeping in mind that you're creating it for the graphically rich Web. When you're done, save it as an HTML file.

What types of pages can you build with your word processor? Any page that includes text, graphics, tables, and other Web features, including forms and buttons. In theory, you could even create PC World Online's home page. The parent.hood site featured in this month's review of Web authoring tools took 30 minutes to make using Microsoft Word's Internet assistant (not counting the time it took to create the graphic).

suit your needs, see "Web Software for the Rest of Us" in this issue.

Step 3: Add Content and Stir

SIMPLY PROVIDING your company's profile, your favorite hobbies, or pictures of your dog on the Web is just a start. Chances are you can enhance your site with loads of important information already in your files.

If you have a business, you might want to post catalogs and price lists online. Such data is normally found in spreadsheets and databases, and there are several tools for easily converting these files to HTML. Most obvious are HTML add-ins designed for application suites, such as Microsoft's Internet assistants for ▶

TIP: Make your small business look bigger by getting your own domain name. Many ISPs offer *virtual domains* that do not include the address of the ISP's server. Instead, your Web address will read something like this: www.yourcompany.com.

TIP: If you see an effect you like but don't know the HTML tags, steal the code! Just don't copy any content. Select *View•Document Source* in Navigator (or *View•Source* in Internet Explorer), and copy and paste the code into your HTML authoring program.

the Office 95 apps. The Excel Internet assistant takes a cell range and converts it into an HTML table, along with some of the formatting, including cell colors. Access's assistant converts a table or query to HTML. These assistants are free from Microsoft's Web site (http://www.microsoft.com/msdownload).

Another great tool is *PC World*'s free Universal Spreadsheet Converter, which converts input from any brand of spreadsheet to HTML tables. Visit http://www.pcworld.com/cgi-bin/tabdemo.pl to try it out.

Keep in mind that most tables created with HTML conversion tools are static, so users can't modify them in any way, and whenever the data changes you need to post another version of the table online. If you're an Excel user and need a more dynamic, interactive solution, consider posting the Excel file itself online and encouraging your visitors to download the free Excel viewer from Microsoft's Web site. With this viewer, your visitors can manipulate the table from within their Web browser or wait to view it when they're offline.

If you're running a business, you'll want to start thinking about how potential customers can interact with your site. For example, you may want visitors to fill in a form with information that's posted automatically to a database you can draw on for your marketing campaigns.

You'll need a specially written program to do these things. Web programs are created in either Computer Gateway Interface scripts, Java, JavaScript, VBScript, or some other high-end programming language. You'll probably want to hire a programmer to create such programs, and if you decide to use CGI, make sure your ISP allows CGI scripts (few do).

Step 4: Make It Lively

THE SAME PEOPLE who'd sit through a lengthy newspaper article and savor every word will ignore that article if it's posted online. On the Web, time is literally money, and most of us have the attention span of a mosquito.

Liven up your text with graphics, clever designs, and a few moving parts. But be careful. Like makeup, these ornaments should be used sparingly. Pile too many on, and your page will look like Tammy Faye Bakker on a bad hair day. See "Ten Web Elements We Love to Hate" for tips on avoiding that look.

Here are a few bare necessities for adding pizzazz to your Web page.

❑ **GRAPHICS SOFTWARE:** There are lots of sites on the Web where you can find free graphics to include in your Web site (see "Resources for Web Publishers"). But if you want to create your own graphics, you'll need to invest in a package that supports JPEG and GIF, the most popular Web graphics formats. Even if you can't draw a stick figure to save your life, some of these programs are clever enough to do it for you, making you look like a pro.

Among the best of breed are JASC's PaintShop Pro 4.0, a program that rivals competing high-end graphics products; Adobe's PhotoDeluxe, which is perfect if you've never used a paint program before because it literally paints for you; and Corel's CorelWeb.Graphics ▶

Resources for Web Publishers

NEW WAYS TO IMPROVE YOUR WEB SITE are always popping up, including updates to HTML. Here are some of our favorite Web resources, plus a few sites that let you download free graphics.

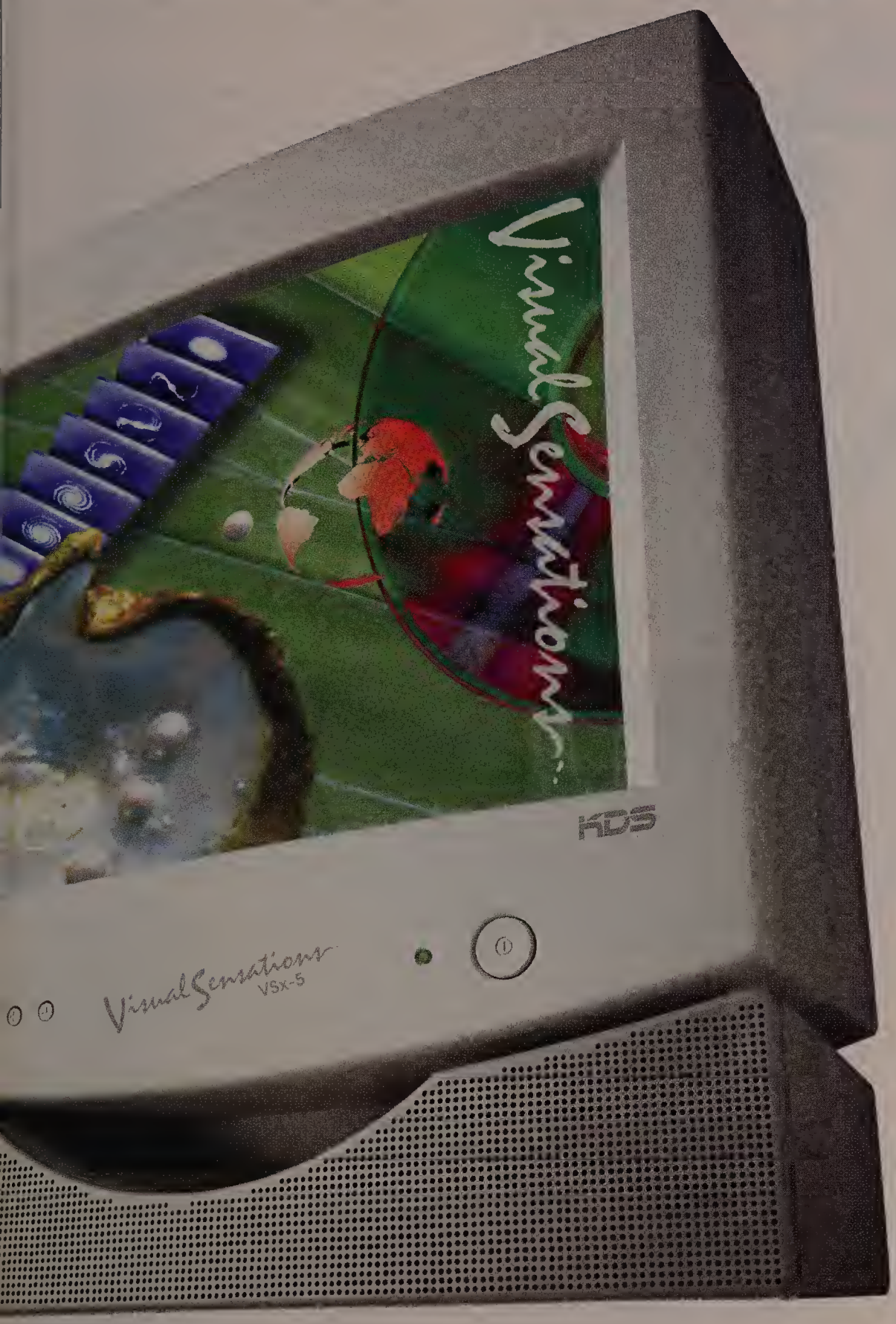
WEB SITES

Doctor HTML	http://imagiware.com/RxHTML/	A thorough HTML syntax checker, which also checks for broken links and spelling errors.
Introduction to HTML	http://www.cwru.edu/help/introHTML/toc.html	An interactive tutorial for beginners and intermediate users.
The Web Designer	http://web.canlink.com/webdesign/nl.htm	Everything you need to know about creating and maintaining a Web site.
The Background Sampler	http://home.netscape.com/assist/net_sites/bg/backgrounds.html	Background GIFs for your HTML documents.
Randy's Icon and Image Bazaar	http://www.iconbazaar.com	Lots of free, cool graphics and icons for your site.

BOOKS

Web Publishing With Word, Asha Dornfest, Sybex, 800/227-2346, 1996, $24.99	An easy-to-follow tutorial for using Word's Internet assistant as your HTML authoring program.
HTML for Dummies, Ed Tittel and Steve James, IDG Books, 800/762-2974, 1996, $29.99	Might as well have fun while you're learning HTML.
How to Use HTML 3, Scott Arpajian, ZD Press, 800/688-0448, 1996, $24.99	Step-by-step instructions cut down the learning curve in no time.

Simply Sensational.



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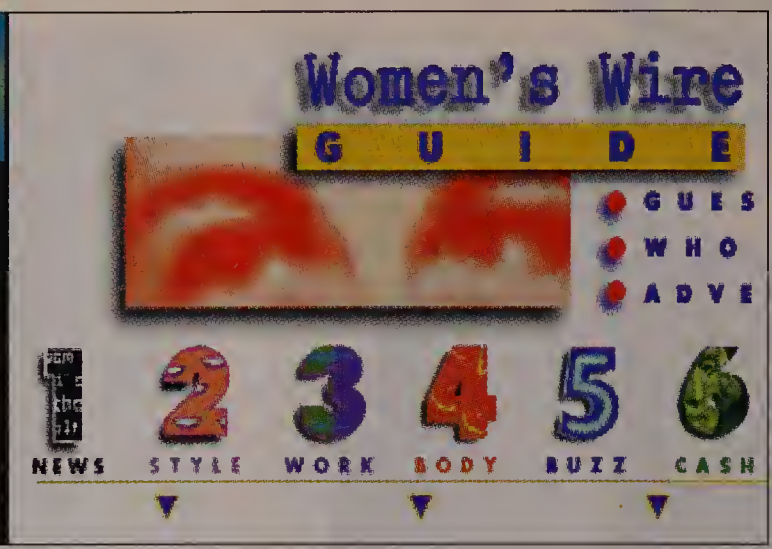
ELEMENTS OF WEB DESIGN:

Women's Wire (www.women.com/guide) used a colorful imagemap instead of plain text to lead visitors to different parts of its Web site.



Suite, a package of utilities especially for Web designers.

- CorelWeb.Graphics Suite $199; Corel; 800/772-6735

READER SERVICE NO. 785

- PaintShop Pro 4.0 $69; JASC; 800/622-2793

READER SERVICE NO. 786

- PhotoDeluxe $85; Adobe; 800/888-6293

READER SERVICE NO. 787

❑ **GRAPHICS HARDWARE:** Some sites, such as a real estate page or a missing children bulletin board, call for actual photos, not just graphics. If that applies to your site, consider investing in a scanner or digital camera.

Polaroid's PhotoPad and Epson's PhotoPlus are compact scanners that connect to your computer's parallel port and turn your photographs into electronic files at the touch of a button. A scanner is a good idea for small Web sites that feature only a few photos because scanners are less expensive than digital cameras.

TIP: To find out if the version of your word processor is also a Web publisher, choose *File•Save As* and see if HTML is one of the document types. If not, go to the software vendor's Web site and download the version you need.

If you want to skip going to your local Fotomat, digital cameras like Epson's PhotoPC and Kodak's DC20 Camera store photos in RAM. Consider using a digital camera if your Web site calls for many photos that need constant updating. You'll end up saving money on film and processing, and you won't have to wait to get your pictures developed.

- Epson PhotoPlus $199, PhotoPC $499; Epson; 800/289-3776
- Kodak DC20 Camera $350; Eastman Kodak; 800/235-6325

READER SERVICE NO. 789

- Polaroid PhotoPad $299; Polaroid; 800/662-8337

READER SERVICE NO. 790

❑ **ANIMATION SOFTWARE:** With all the talk of using Java and other add-ons to bring Web pages to life, you should know that there's an easier way to animate your Web pages. Animated GIFs are a series of static graphics files shown in rapid succession to create the illusion of an animation. These animations are much smaller than AVI or QuickTime video files, and are becoming the Web's animation standard. One of the most popular GIF animators is Alchemy Mindworks' $25 GIF Construction Set. Another is Pedagoguery Software's $28 Gif.gIf.giF. Both are available as shareware on PC World Online.

If you like the idea of Java but don't like the taste, try Anawave Software's ▶

Beyond Web Publishing 101

SOME OF THE MOST TALKED-ABOUT technologies of the nineties are evolving on the Web: Java, ActiveX, and VRML. Their cutting-edge effects can mean the difference between dull, static pages and exciting, appealing ones, but they're for advanced Web publishers.

■ **JAVA:** Sun Microsystems' programming language for the Internet is platform independent, which means applications created with Java (usually referred to as *applets*) can run on any system: Windows, Mac, or UNIX. You can use Java to add database functionality to your site (for transactions, for example), for animation, or for other interactive elements.

But Java is primarily the domain of programmers who use software like Symantec's Café and Microsoft's Visual J++ to create their applets. One powerful application that doesn't require a programming background is AimTech's Jamba, an expensive ($495) but slick animation tool. Many Java applets are available free on the Net. Check PC World Online for links to some of the best.

■ **ACTIVEX:** Microsoft's answer to Java is based on a similar concept: an ability to create small Web programs that work across all platforms. ActiveX builds on existing Windows technology and is widely supported by developers. You can create ActiveX *controls* in any programming language or environment, including Visual Basic, C, and Delphi. But like Java applets, they require programming expertise. Many ActiveX controls can be downloaded from the Web.

■ **VRML:** Virtual Reality Modeling Language creates 3-D worlds that visitors can navigate with their mouse. VRML is currently popular among 3-D gamers on the Web, but it's appearing in business settings, such as online shopping, where you can click on a product you want to buy and move it around to see it from all angles. You can create VRML "worlds" with tools such as Caligari's Pioneer (http://www.caligari.com) or Virtus's 3-D Website Builder (http://www.virtus.com). VRML doesn't require programming skills because the development tools are visual, but a graphics design background will go a long way.

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Egor Animator 2.0, a program that generates animations using a simple wizardlike interface. Like animated GIFs, Egor's animations are made up of a series of graphics, but they're saved as Java applets that you embed in your Web page. (For an explanation of Java and other hot Web technologies, see "Beyond Web Publishing 101.")

▪ Egor Animator 2.0 $50; Anawave Software; 800/711-6030

READER SERVICE NO. 791

❑ **IMAGEMAP SOFTWARE:** Static graphics serve little purpose on the Web beyond dressing up dull text pages. To take full advantage of the Web's interactivity, turn your graphics into *imagemaps* that contain hyperlinks to other Web pages or to particular files. For example, when someone clicks in different places on an imagemap of an orchestra, it can play audio clips of various instruments.

Use a program that allows you to link images to files by pointing and clicking. CorelWeb.Graphics Suite and other programs create imagemaps easily. But if you don't want a full-blown graphics package, go with Group 42's WebImage or Boutell.Com's Mapedit, both of which are available as shareware from PC World Online.

❑ **SOUND CLIPS:** The easiest way to add sound to your Web page is with simple HTML tags. For example, **Listen to the President (90K).** lets a visitor to your Web site download and listen to a sound bite from the president. You can also link a sound clip to an imagemap. Remember to keep these sound clips brief, however, because your guests will lose patience if they're constantly waiting for sound files to download. You can use the Sound Recorder that ships with Windows to capture and edit audio.

One way to cut download times is to compress the .wav file. Voxware (http://www.voxware.com) offers a free utility called ToolVox that compresses .wav files at a 53:1 ratio. You need to add a link to Voxware's site so your visitors can download the free ToolVox Player.

Step 5: Raise the Curtain

AFTER YOU'VE BUILT your site, store it on your hard disk while you get the bugs out. Place all the necessary files—HTML documents, graphics files, sound clips, and so on—in one directory. If there are lots of files, you might want a subdirectory for things like graphics. View the HTML document with your browser to make sure that everything looks right, tweaking anything that doesn't. Most browsers have a File•Open menu for viewing local files. Look at the site with several browsers to ensure that people can enjoy all your special effects regardless of what browser they use.

If you want an expert opinion on your HTML documents, people on the Web are willing to help. The World Wide Web Consortium lists a variety of sites that can help analyze your HTML documents (http://www.w3.org/pub/WWW/Tools).

When you're satisfied with all the elements of your Web site, post your creation by transferring your Web pages and all related files to the ISP's server.

You'll need instructions from your provider. In addition, unless your Web authoring package comes with a special tool for posting Web pages, you'll need a file transfer protocol tool. The best one around is Winsock FTP, which is available as shareware on PC World Online for both Win 3.*x* and Win 95. You can also get the free Web Publishing Wizard for Windows 95 from Microsoft's site (http://www.microsoft.com/windows/software/webpost/). This wizard takes your files and moves them to your site, whether it's located on an ISP's server or on a commercial online service.

Step 6: Get Noticed

AFTER ALL YOUR EFFORT, how will anybody find your creation? Fortunately, search engines like Yahoo and InfoSeek constantly monitor the Web and ▶

IT'S ALIVE! Just tell Egor to place several images in a sequence; you then set options such as size, delay between frames, color, and so on. The program generates the Java applet and the relevant HTML code you'll need to embed in your document.

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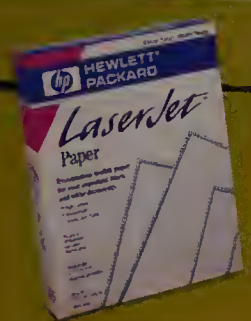

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ELEMENTS OF WEB DESIGN:

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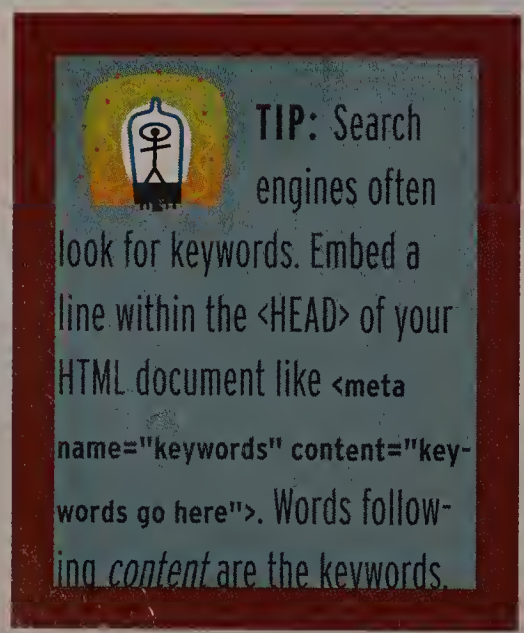
update databases used by millions of people who are looking for new stuff.

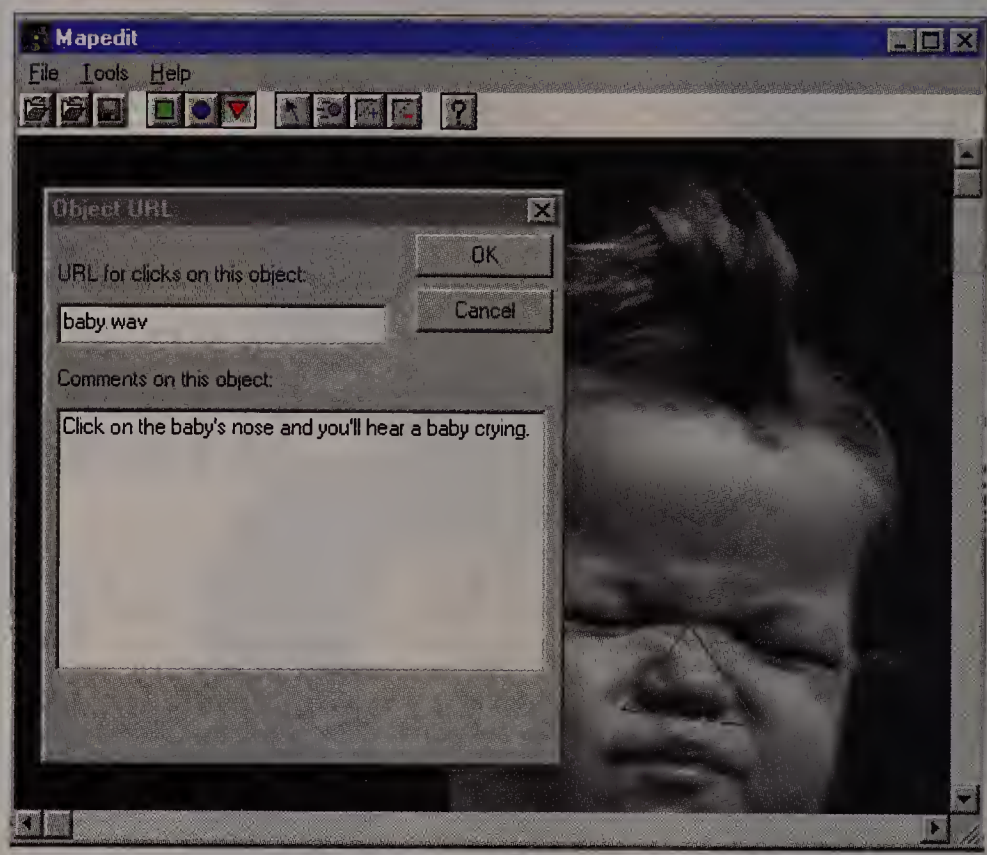
But if you wait to be noticed, odds are nobody will find you among the millions of other Web pages out there. The solution is to submit your site address to search engines. Just go to sites like Yahoo or InfoSeek, select the Submit URL feature, and tell them who you are and what your Web address is.

To save time, use one of the wholesale URL submission sites that post your information to as many search engines as possible. The service is free. Try Submit-It (http://www.submit-it.com) and PostMaster (http://www.netcreations.com/postmaster/index.html).

Another way to get noticed is to join a service such as the Internet Link Exchange (http://www.linkexchange.com). This free service manages reciprocating links among its members. When you sign up, you'll get various ads on your site that link to other sites, and ads promoting your site will be placed at other locations.



TIP: Search engines often look for keywords. Embed a line within the <HEAD> of your HTML document like **<meta name="keywords" content="keywords go here">**. Words following *content* are the keywords.



TO DESIGNATE ANY PART of an image as a hypertext link, bring up Mapedit (or a similar program), mark the area for the hot spot, and type in the URL for the link. When you save the file, the program generates the HTML code that identifies the image as an imagemap.

Step 7: Don't Just Site There

ONCE YOUR SITE IS WORKING, you need to make sure you always have fresh information and design elements, or nobody will visit your Web site twice.

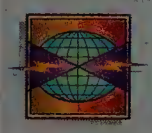
Most important, you need to monitor the links in your Web site to make sure they're up-to-date. For example, if your site includes a link to another company's site and that company goes out of business, you need to make sure you don't send visitors down a dead-end street. If the number of links is small, you can keep tabs on them manually. If not, authoring tools such as Microsoft FrontPage make it easy to track all your links.

Finally, to keep track of activity on your site, get a program like Boutell.Com's Wusage or e.g. Software's WebTrends. These programs take log files from your ISP's server and turn them into charts and reports. Activity logs tell you how many visitors you've had and what they do at your site. Use this information to analyze your site's performance and tweak parts of it that don't attract attention. Both Wusage and WebTrends are available from the vendors' sites (http://www.boutell.com and http://www.egsoftware.com, respectively).

Most ISPs give you counters that you can place on your site to monitor the number of visitors. If you don't like the look of your ISP's counter, log on to Mr. Web Counter's site (http://www.digits.com/create.html), where you'll get the same service from a third party for free.

Yael Li-Ron is senior online editor for PC World Online. ■

INTERNET



FOR LINKS TO COMPANIES, resources, and files mentioned in this article, visit PC World Online (**http://www.pcworld.com**).

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by Dan Krewson
SOC 101
Prof. Schoen
June 29, 1996

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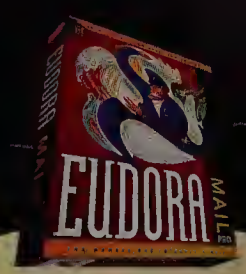

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Web Software for the Rest of Us

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Four graphical authoring packages claim to make Web page creation easy. But after putting them to the test, our reviewer says it just ain't so.

By Scott Spanbauer

ILLUSTRATIONS BY DOUG ROSS

WOULD YOU BULLET a paragraph with '<LI>'? Display a picture with 'IMG'? Paint your house #855E42? Whatever else you can say about it, Hypertext Markup Language—used to create and describe Web pages—can't be called intuitive. That's why you should consider creating your World Wide Web site with a ▶

program that lets you work on a graphical view of your page and see your changes as you make them.

To see how these programs stack up, I put four graphical HTML editors through the real-world test of creating a mock commercial Web site, then uploading the resulting files to a UNIX-based Web server. The programs I tested were Macromedia's Backstage Designer, Microsoft's FrontPage, SoftQuad's HoTMetaL Pro, and a prerelease version of Netscape Navigator Gold. I picked these four because all allow you to create fairly complex pages by manipulating text and graphics, without getting your hands dirty with HTML. Three other programs—Adobe PageMill, Claris Home Page, and Forman Interactive's Internet Creator—were not ready in time for this article; and another, Visual Web from Tomorrow's Horizons, proved too buggy to review. Although the four programs we tested could handle most of the work, none merited a Best Buy—all were flawed in some respect. In fact, your best bet is to buy more than one.

These programs aren't quite WYSIWYG (what you see is what you get), because there's no way to be sure exactly how a page will appear on every computer it may be viewed on. Also, these products lack the drag and drop capabilities of a desktop publishing program or a good word processor. For instance, in Microsoft Word, you can adjust the width of a table cell by dragging the dividing line; but in Microsoft FrontPage, you must bring up a dialog box and enter the number of pixels.

Other Options

YOU CAN USE OTHER TOOLS to create Web pages. If your needs are simple, your word processor will probably handle the job just fine, although it's bound to lack features found in a dedicated program. At the other extreme, there are plenty of sleek editors for writing your own HTML code. These tools are great for experienced Web page developers who know the tags for creating bulleted text and the assorted syntax. But studying code isn't the easiest way to gauge whether your design flourishes are getting in the way of the text—or if your text is getting in the way of your design flourishes. For more information, see "Suite Web Design Tools" and "Straight HTML: Building Pages by Hand."

To test the tools, I tried to re-create the same sample Web site in each one. The original site, created by *PC World* Senior Editor Yael Li-Ron, was for Parent.hood, a fictitious business where you could buy a Mercedes stroller or a book on the All-Sugar Infant Diet. The home page alone contained two pictures—one an image map where clicking the baby's nose made it cry—plus links to the other three pages and real Web resources, a hidden table that gave me control over object placement, and a scrolling message at the bottom of the screen (created with a generic JavaScript applet Yael had taken off the Web). Other pages included a

No Such Thing as a Perfect Web Authoring Program

ALTHOUGH ALL FOUR of the reviewed programs make it easier to create Web pages, especially for beginners, no one program offers a complete set of tools worthy of "Best Buy" distinction. In fact, each seems to lack at least one significant feature, meaning you may have to use a combination of tools. My recommendation is to start with FrontPage, the easiest of all the programs to use, then bring in HoTMetaL Pro, the most powerful of the four, when you hit FrontPage's limitations. But keep a text editor handy, as well as a separate FTP program for posting your files to a server.

Suite Web Design Tools

IF YOU USE THE CURRENT VERSION of Microsoft Office, Lotus SmartSuite, or Corel WordPerfect Office, you already have a relatively WYSIWYG environment for creating Web pages—and one you're familiar with. It may not have every feature of a dedicated Web development tool, but it'll have all you need for simple pages.

Most of the applications that come with the Windows 95 versions of SmartSuite and WordPerfect Office can convert their files to the HTML format. Depending on when your Microsoft Office 7.0 CD-ROM was manufactured, you may already have Web capabilities built into Word; to find out, select *File•Save As* and see if one of the 'Save as type' options is 'HTML Document'. If you don't see the option, you can download a Word add-in, as well as add-ins for Excel, PowerPoint, and Access, from Microsoft's Web server (http://www.microsoft.com). New versions of Microsoft Office and Lotus SmartSuite, with considerably more Web-authoring power, may be out by the time you read this.

These programs are particularly adept at converting existing files into Web pages. For instance, the word processors will convert document formatting to the best of HTML's abilities (HTML can't handle, say, specific fonts or overhanging indents), and the spreadsheets will turn their files into HTML tables (though 1-2-3 version 5.01 has no Web support whatsoever). The presentation programs will convert a series of slides into a Web site that walks a user through the presentation—with each slide appearing as a graphic on its own page.

WORDPERFECT For creating basic Web pages from scratch, the best tools in these suites are the word processors. Corel WordPerfect 7.0 is by far the closest thing to a real Web page creation tool in any of the suites. An Expert walks you through the creation of a new Web page, letting you enter links, title your page, pick colors, and so on (by default, the Expert

more conventional table, a scrolling message done with Microsoft's proprietary <Marquee> tag, a long form built into a numbered list, and an "Under Construction" notice that relieved me of having to build an entire site. To see how well each program re-created the test site, go to PC World Online (http://www.pcworld.com/nov96/samplepages); and while there, check out Yael's explanation of the HTML code she used to build her site (http://www.pcworld.com/nov96/seehtml.html).

How'd They Do?

IF YOU'RE WILLING TO TYPE in your tags by hand, every text editor—even Notepad—will support every HTML feature. But if you're building your pages graphically, you'll want every special formatting trick available from a menu or dialog box. To test the programs as thoroughly as possible, I attempted to recreate the Parent.hood site in each one without resorting to writing code. No single program had all the features I needed, although some—notably HoTMetaL Pro—were much better than others.

Part of the problem is that many "standard" HTML features aren't actually part of the standard. The current official HTML 2.0 standard, approved by the Internet Engineering Task Force, doesn't include features such as tables and scrolling text that have become expected in Web pages. A program, therefore, can claim to support every feature in HTML and still leave out some of the most common and useful ones. A new standard, 3.2 (a proposed 3.0 spec failed to gain wide support), is in the works. For an overview, see the WWW Consortium's HTML Web page (http://www.w3.org/pub/WWW/MarkUp).

Here's how the programs performed on the major tests I put them to:

❑ **FORMS** If you want your readers to give you their names or select an option, you'll need to create forms, a standard part of HTML but complex to do by hand. Only one program—Navigator Gold—doesn't do forms. The others let me create the standard form fields in the Parent.hood site easily enough. But no programs could also treat the test form as a numbered list, requiring me to resort to hand-coding to finish the page.

❑ **TABLES** Though not part of the approved spec, tables have become a de facto HTML standard. At first glance, a Web page table appears to be just what it sounds like, a grid for displaying data in rows and columns. But designers have learned to use tables as a way around some HTML limitations. For instance, precise horizontal spacing is almost impossible in HTML. But with a table, you simply add columns to move your elements over. The result looks great.

Creating tables by hand is one of the more complex tasks in HTML. You first create an empty table, then the first row, then each cell and its content. Each element also needs both open and close HTML tags—each cell, each row, and finally the entire table. One tag out of order or missing can turn your page into gibberish. Three of the four reviewed programs let you create tables by using a menu command and customize cell size, cell width, border size, and content alignment from a properties dialog box. Backstage Designer, however, doesn't support tables at all.

❑ **GRAPHICS** All of the programs I looked at have simple tools for making your page display an image in either the .gif or .jpg file format. Technically, a picture is never an integral part of a Web page, but you can make it look like one by using a transparent .gif, which lets your page's background color or pattern "bleed" through the transparent color in an image. This arrangement would, for instance, permit a red bullet on a white background to appear red, whether the page's background is white, gray, black, or bit-mapped. Only FrontPage and HoTMetaL Pro can give your pictures that transparent look.

On the Web a picture points to a thousand words, since you can use your ▶

assumes that you're creating a personal page, dividing it into such sections as 'My Hobbies and Interests' and 'My Personal Background'). Once the Expert is gone, buttons on a toolbar make it easy to add links, change colors, select fonts, and so on. WordPerfect will even let you create image maps, but fancier capabilities, like frames, are beyond its reach.

■ **WORD FOR WINDOWS** Adding the Internet Assistant to Microsoft Word (the file is wrdia20z.exe) will give you a serviceable tool for simple pages, but it's limited. No wizard walks you through the initial process, and if you don't think to give your file a header to help identify it, it won't have one. The Internet Assistant also can't handle frames or image maps.

■ **WORD PRO** Of the three word processors, Word Pro is the weakest HTML tool. It's easy to convert an existing document to HTML via the File•Save command, but unlike its competitors', Word Pro's interface doesn't change to make Web page creation easier. For instance, where WinWord and WordPerfect display recognizable buttons for creating links when you're working on an HTML file, in Word Pro you must select *Create•Click Here Box* to create links.

If you're making only simple pages, go ahead and use your word processor. But for anything more complicated, get a real Web tool. —*Lincoln Spector*

graphic as a link to another page. This is a neat but difficult trick, and authoring programs offer mixed support for it. Image maps constitute an advanced variation on these simple links: They let you designate multiple "hot spots" within an image, each linking to a different destination. Only Navigator Gold won't help you create image maps at all, although FrontPage's implementation is useless if your server (like most) isn't running Windows 95 or NT.

Getting Your Hands Dirty

AS YOU'VE PROBABLY guessed by now, at some point with any of these programs you're likely to give up on all those WYSIWYG features and hand-type the code. You can always do this dirty job by closing the file in the HTML authoring program, then opening it again in the text editor of your choice. If you use FrontPage or HoTMetaL Pro, this is exactly what you'll have to do, because they don't come with a text editor of their own. Navigator Gold also lacks a text editor, but it gives you a convenient way to open the current file in the editor of your choice. Backstage Designer incorporates a simple editor that gets you down to ASCII in a couple of clicks—it's nothing exceptional, but at least it's there.

Posting to a Server

WHEN YOU'RE DONE laying out a page in a word processor, you click the Print icon and wait for the final result to appear on paper. Would that publishing to the Web were so easy! Instead, you have to copy all of your files from your own computer to the server; and dragging and dropping in Windows Explorer isn't going to do the trick, either. Chances are your Web server is a UNIX system and requires you to use a UNIX standard called File Transfer Protocol to move a file to it. Obviously, a Web design tool that has a built-in FTP tool can make your life much easier.

With each program, I tried to upload the re-created test site to a Web server. How the programs performed this step ranged from so-so to useless to not-at-all. You'll do best to handle this process ▶

Straight HTML: Building Pages by Hand

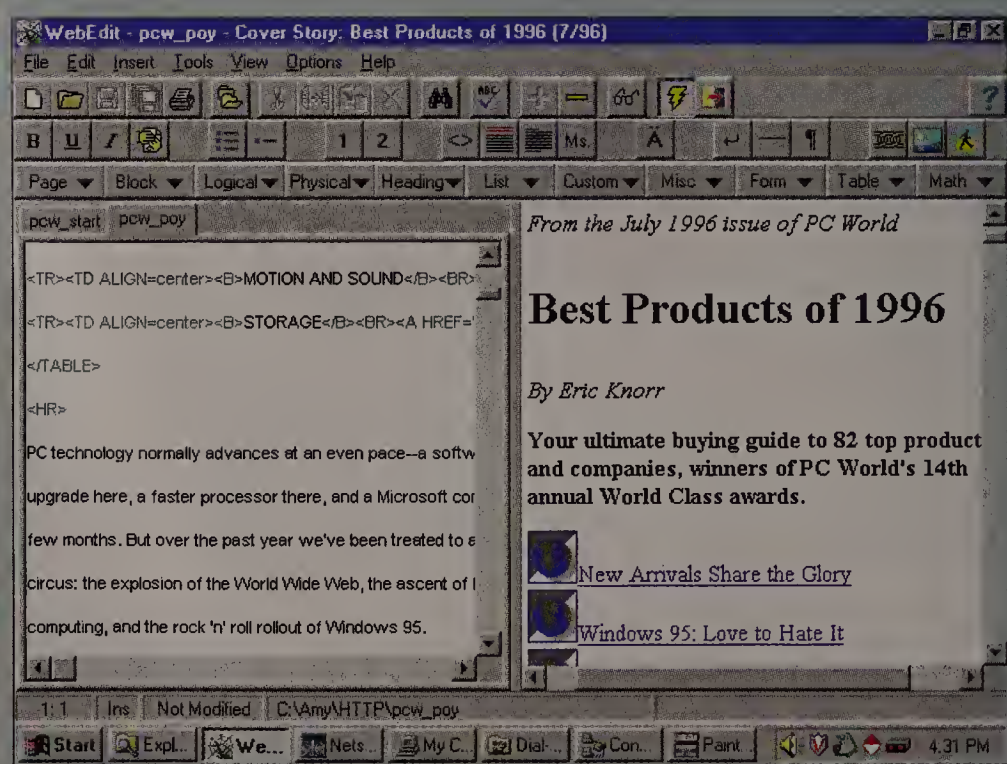
WANT A FAST, INEXPENSIVE TOOL that gives you complete control over every element of your Web page? Consider a straight HTML editor that exchanges WYSIWYG features for direct access to the code that defines your page. There are probably more HTML editors on the Net than weeds in my vegetable garden. These four, although far from perfect, are my favorites. And they're all available as try-before-you-buy shareware.

FLEXED V1.3F The features that lift FlexEd above the mundane are its pop-up dialog boxes for manipulating tag attributes. Double-click a tag, and you'll get full control over its formatting options. Two stumbling blocks: nonstandard editing keys and sparse help menus. FlexEd v1.3f registration $25; Infoflex Pty Ltd., http://www.infoflex.com.au/flexed.htm

GOMER HTML EDITOR VERSION 1.4 I fell in love with Gomer immediately, thanks largely to the thorough way it helps you start a new document. In addition to walking you through an HTML page's most basic setup, Gomer reminds you at the beginning to set background, text, and link colors, a task you'd otherwise have to remember to perform later. But Gomer's cramped toolbar and helper dialog boxes could use a redesign. Gomer HTML Editor version 1.4 registration $15; Stoopid Software; http://www.clever.net/gomer/index.html

REVOL WEB WORKER FOR WINDOWS 95 VERSION 1.3 With its lack of descriptive terms and context-sensitive help, Revol Web Worker is best for coders who already know their way around HTML. But if you're advanced enough for it, its comprehensive toolbar and drop-down tag menus make for smooth working. Revol Web Worker for Windows 95 Version 1.3 registration $19; Jon Lister, http://webzone.ccacyber.com/www/jlister/revol.htm

WEBEDIT 2.0 32-BIT PROFESSIONAL WebEdit is my all-time favorite, thanks to the well-organized layout of its drop-down tag menus, its time-saving split-screen preview mode, and its in-depth help. Straightforward wizards and templates make it a good choice for beginning coders. I like the multicolored tag coding, but I'm disappointed that WebEdit only highlights tags when a document loads: Any file you build from scratch doesn't have highlighting until you close and reopen it. This is by far the most expensive editor here, but sometimes you really do get what you pay for. WebEdit 2.0 32-bit Professional registration $79.95; Nesbitt Software Corp.; http://www.nesbitt.com —*Amy Helen Johnson*



CODE AND IMAGE, side by side: With WebEdit, you preview your page on one side of the screen while editing your HTML code on the other.

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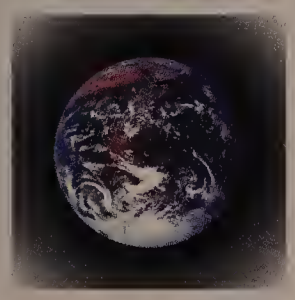

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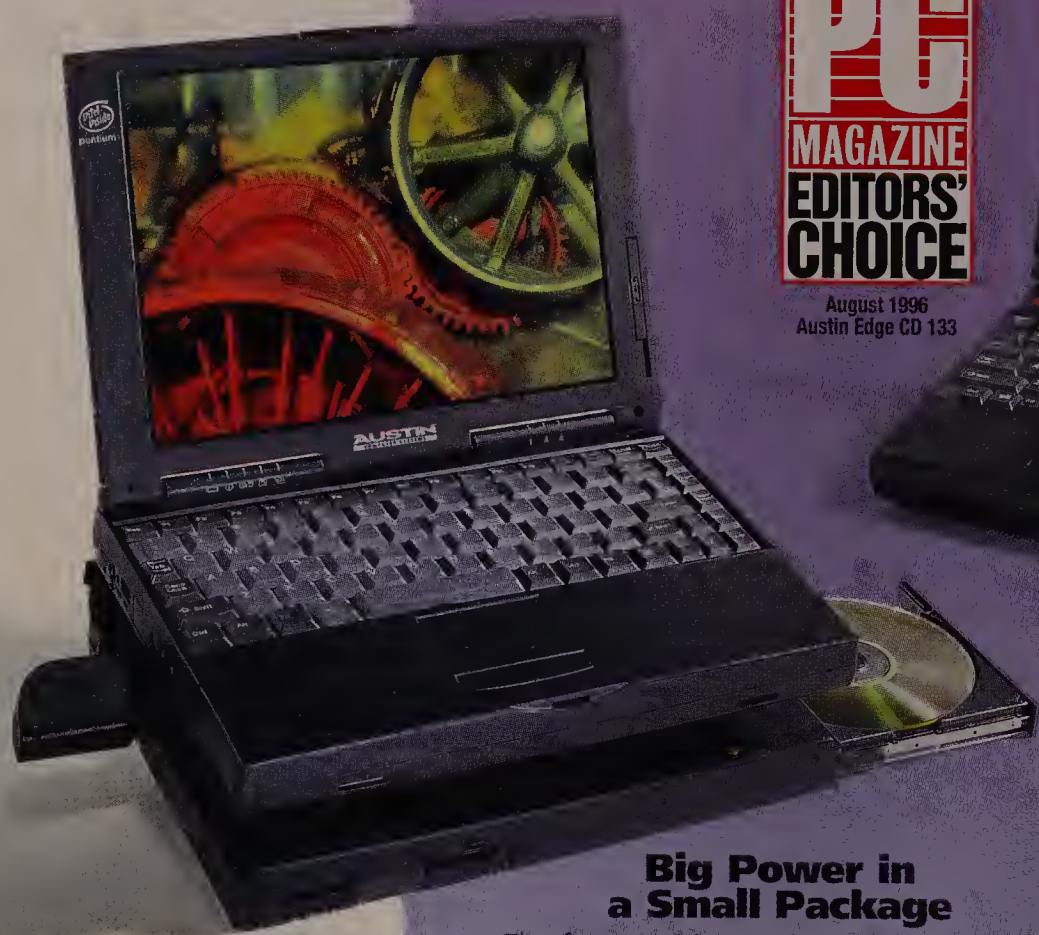
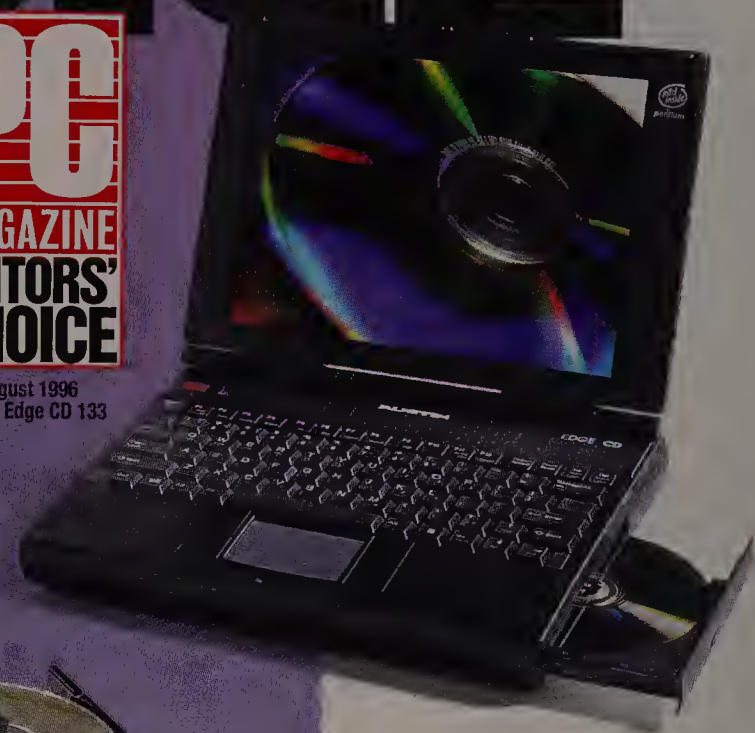
PC MAGAZINE EDITORS' CHOICE
August 1996
Austin Edge CD 133





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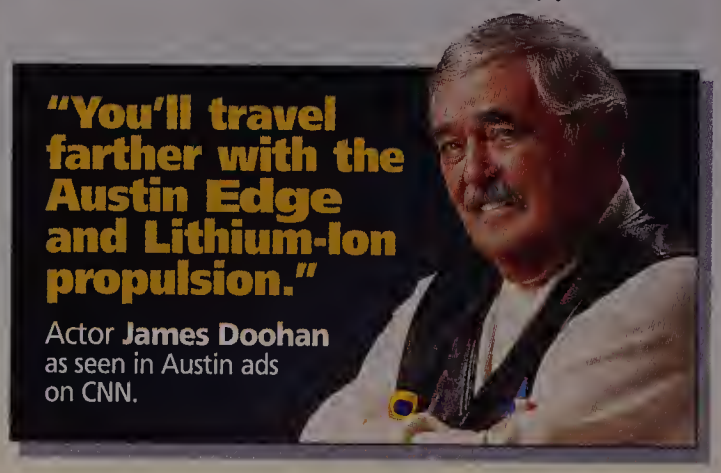

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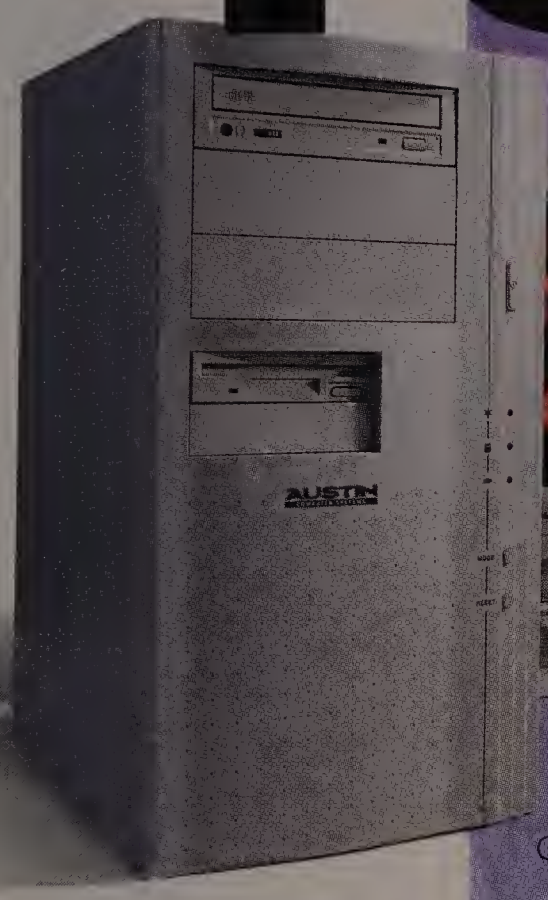

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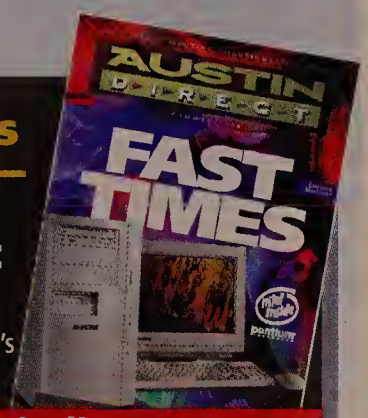

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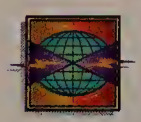
with a separate program, and I can recommend two that make the job easier. The first is Ipswitch's excellent WS-FTP (http://www.ipswitch.com), a shareware product that helps hide FTP's unfriendly syntax. The other is Micro-soft's free Web Publishing Wizard, which you can download from the company's Web site (http://www.microsoft.com/windows/software/webpost/default.htm). Unlike WS-FTP, the wizard doesn't let you choose which files get uploaded—it simply transfers everything in the directory you specify. To its credit, however, Microsoft's wizard also makes it easy to publish your files on America Online or CompuServe, which have proprietary transfer systems.

With luck, someday someone will market a Web page design program that handles every trick of HTML and Web publishing. Of course, the program will be out of date five minutes later.

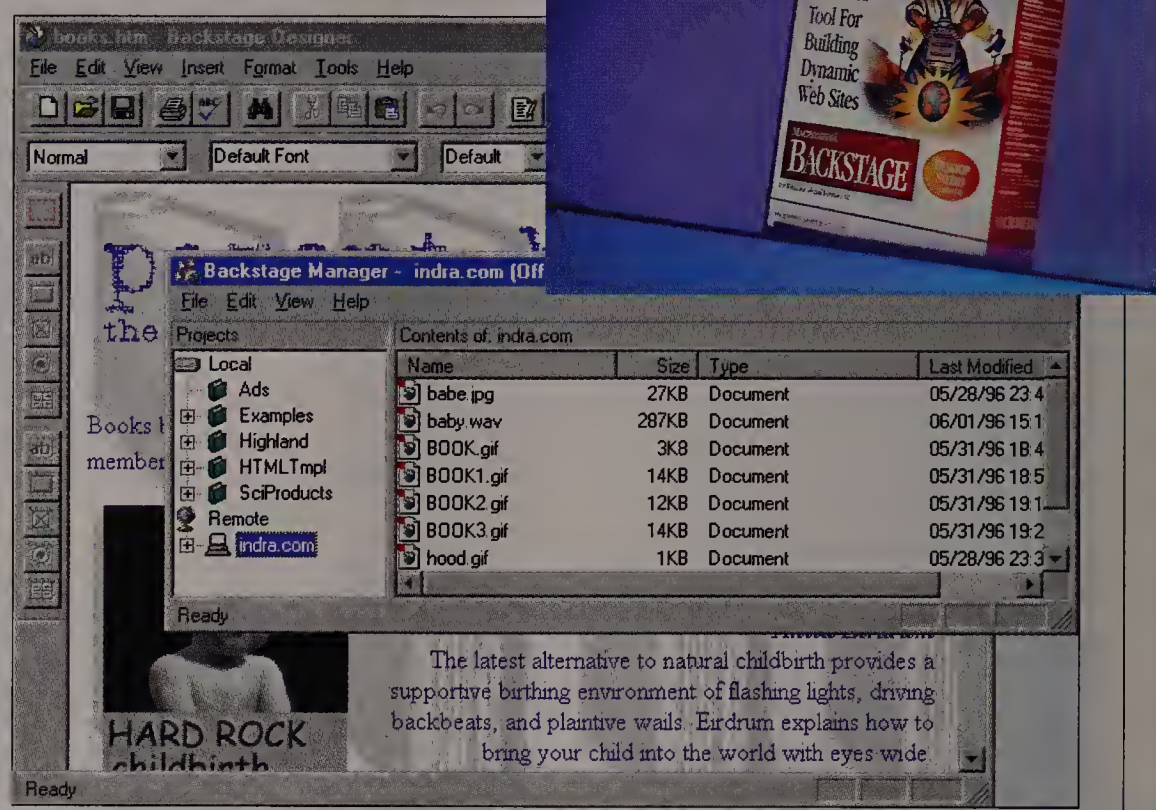
The program proved easy to use. To modify an element's settings, all I had to do was double-click the element and change the settings in a dialog box. But Backstage Designer's inability to handle tables is unforgivable.



Look for more information on Web authoring tools and find the files mentioned in this article at http://www.pcworld.com. Contributing Editor Scott Spanbauer (http://www.indra.com/~scott) is the author of The No B.S. Guide to Windows 95 *(No Starch Press, 1996, 800/420-7240). Amy Helen Johnson writes about the Internet, application development, and databases. Yael Li-Ron is a senior editor and Lincoln Spector a senior associate editor for* PC World.

For more information on all products in this article, circle reader service no. 906.

IT LOOKS LIKE INTERNET EXPLORER, but it's Backstage Designer's handy Backstage Manager utility for uploading pages to remote servers.



MACROMEDIA BACKSTAGE DESIGNER

PRO: Supports Java, ActiveX, and Shockwave applets; helps you publish to a UNIX server; large clip-art library

CON: No table support

BACKSTAGE DESIGNER makes it easy to dress up your pages with all sorts of animated bells and whistles. But it leaves out one of the most common and useful HTML elements: tables.

The program proved easy to use. To modify an element's settings, all I had to do was double-click the element and change the settings in a dialog box—as long as the element wasn't a table. Backstage Designer's inability to handle such a basic part of HTML—albeit one not yet incorporated into the official standard—is unforgivable. By aligning a graphic next to a block of text, I managed to approximate the effect of Yael's table, but it was a considerably bigger hassle to achieve a less satisfying result.

On the other hand, Backstage Designer can take you well beyond the capabilities of HTML. If you want to add interactive bar graphs or dancing bears to your pages, the program will let you embed Java applets, ActiveX controls, and Macromedia's own Shockwave files. What's more, you can use Backstage Designer's own proprietary extensions to tailor pages to individual readers. For instance, a page could track search terms a reader requested in previous visits, then greet them with a list of related pages the next time they log on. But the extensions that make this possible work only if your site resides on a Windows 95 or NT–based Web server.

Backstage Designer comes with a huge library of clip art and a competent utility for creating image maps. But the accompanying documentation doesn't say much about how image maps work. Backstage Designer also has a utility for moving your site onto a server, but it seems better suited for a Windows server than a UNIX one. For instance, once I moved my pages to the server, they couldn't find their accompanying image files. It turned out that Backstage Designer had inserted a slash at the beginning of the file name in every image link—a must in the program's Windows Web server scheme, but a confusing error in UNIX. I had to remove all the slashes manually. Backstage Designer $79; Macromedia, Inc.; 800/457-1774; http://www.macromedia.com

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MICROSOFT FRONTPAGE 1.1

PRO: Easiest HTML editor to use; offers great view of your Web site's structure; transparent-background tool

CON: No UNIX server support; proprietary image map format; can't edit HTML source

FRONTPAGE IS BY FAR the easiest to use of the four programs, but its power tools are limited to Microsoft's NT-based server and Windows 95.

The editing window shows your page accurately at every step of the way and lets you work on multiple pages simultaneously without littering the Taskbar with icons (as happens with Navigator Gold). As with Backstage Designer, adding new elements is a matter of selecting menu commands or clicking buttons. But manipulating existing elements in FrontPage is easier than in Backstage Designer, thanks to Windows 95–style context menus that pop up when you right-click an object. You can jump directly to character and paragraph-formatting windows; cut, copy, or paste at the selected location; or follow a link as you would in a Web browser.

FrontPage made one particular graphic trick a real breeze. Using a wonderful "magic wand," I was able to make image backgrounds transparent after I'd already placed them on the page. It's a nice convenience when you realize that a picture you've placed needs to blend in with its surroundings—and it's a trick none of the other programs did. If every feature worked as simply as this one, you'd already have created Web pages for everyone in the family, including the dog.

But FrontPage has its own ideas about how to do what everyone else considers common tasks. I created an image map easily, but found that it didn't work once the site was posted to my Internet server. A quick look at the source code revealed non-HTML tags that work only with Windows-based Web servers. Use anything else, such as a standard UNIX server, and you'll have to create image maps manually. Unfortunately, you can't directly edit HTML source code from inside FrontPage, so I had to close the file, track it down on the hard disk, make the changes with a text editor, and ▶

WEB AUTHORING FEATURES COMPARISON

STANDARD FEATURES	Macromedia Backstage Designer	Microsoft FrontPage 1.1	Netscape Navigator Gold 3.0 beta	SoftQuad HoTMetaL Pro 3.0
Street price	$79	$149 [1]	$79 [2]	$159
Minimum RAM (MB)	8	8	8	8
Runs on Windows 3.1/95 and NT	●/●	○/●	●/●	●/●
Graphical HTML creation	●	●	●	●
Single edit and preview window	●	●	○	●
External browser preview	○	○	○	●
Allows HTML source editing	●	○	●	○
Verifies HTML code	○	○	○ [3]	●
Spelling checker	●	●	○	●
Forms	●	●	○	●
NONSTANDARD HTML TAGS SUPPORTED				
Tables	○	●	●	●
Background colors/images	●/●	●/●	●/●	●/●
Frames	○	●	○	●
Marquees	○	○	○	●
Image maps	●	●	○	●
Centered and right-aligned text	●	●	●	●
Fonts	●	○	○	●
GRAPHICS TOOLS				
Creates image maps	●	●	○	●
Includes image editor	○	○	○	●
Creates transparent backgrounds	○	●	○	●
Number of media clips	1200	16	–	1000
PUBLISHING AND WEB SITE MAINTENANCE				
Supports UNIX servers	●	○	●	○
Verifies links	○	○	○	○
ADVANCED FEATURES				
Java/JavaScript support	●/○	○/○	○/●	●/●
ActiveX	●	○	○	●

● Yes ○ No [1] $109 for Office users. [2] Free for members of educational and nonprofit organizations. [3] Only for individual tags entered manually.

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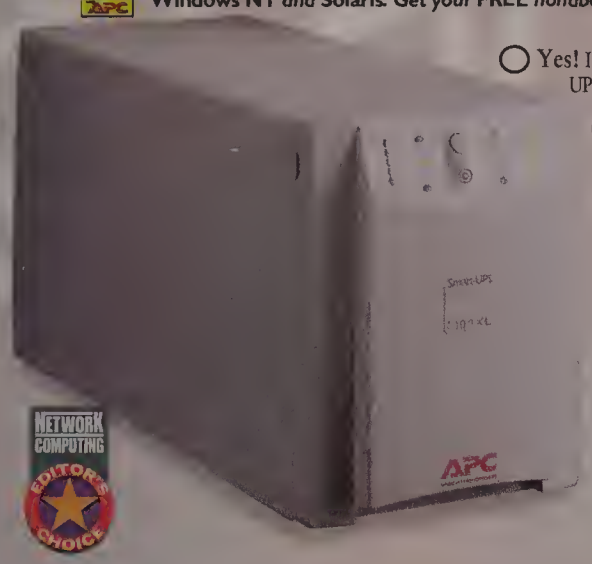

"APC provides the most complete, manageable and controllable UPS in our review."
PC World 11/96

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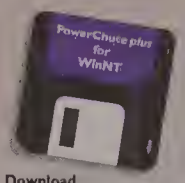

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Name: _____
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City: _____ State: ____ Zip: _____
Phone: _____ Fax: _____
E-Mail Address: _____
Brands of UPS used? _____
Is this your first contact with APC?
☐ Yes ☐ No

◯ Reseller
# of servers sold per month? _____

◯ End User
# of servers on site? _____

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Check out our web solutions today. After all, there's one kind of "big hit" on your web site you don't want to tell your boss about.

SCO OK · Ready! · Runs With Lotus NOTES

"APC provides the most complete, manageable and controllable UPS in our review."

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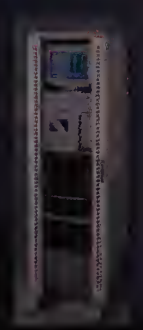

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APC's PowerShield™, ISDN UPS provides critical protection for ISDN

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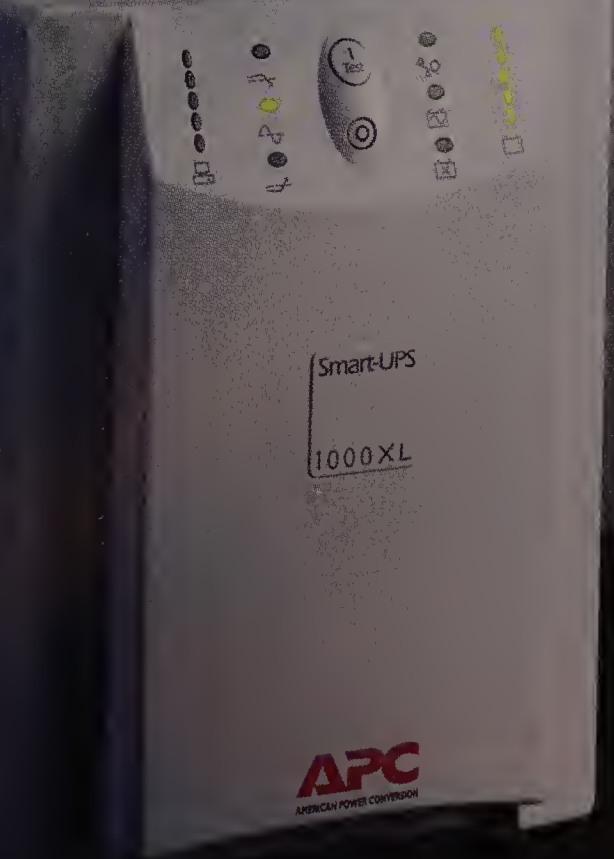

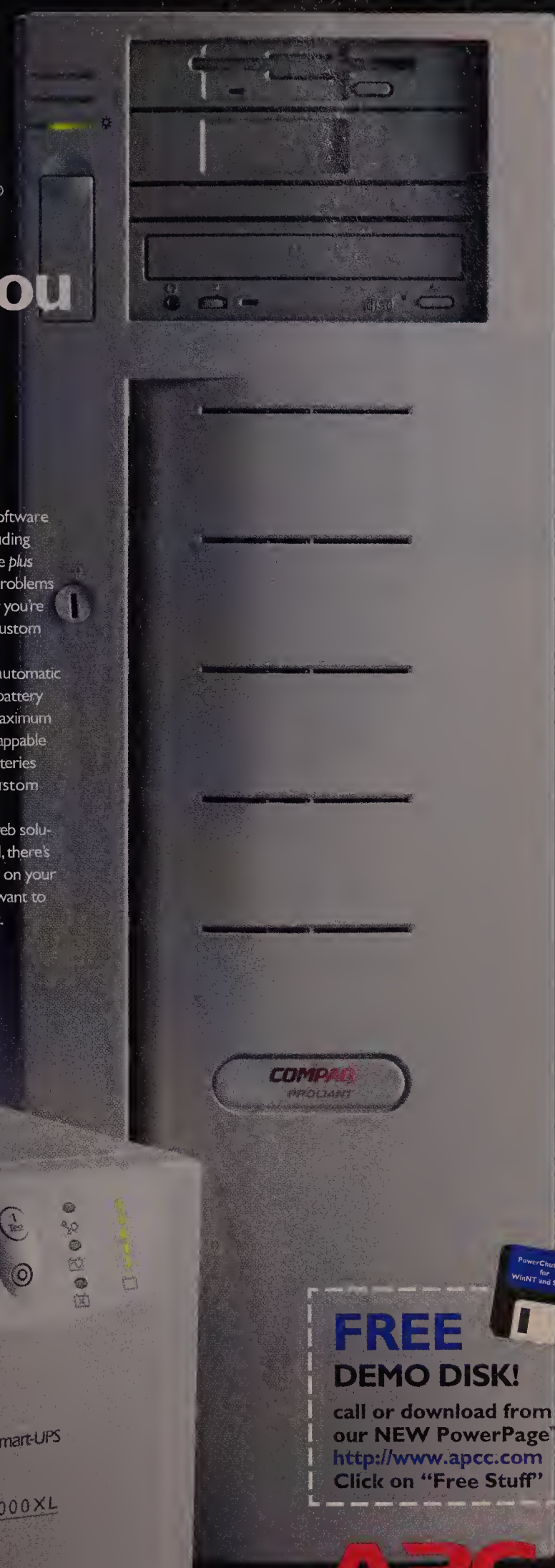

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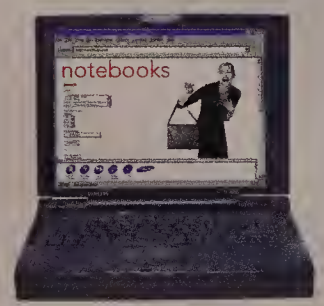

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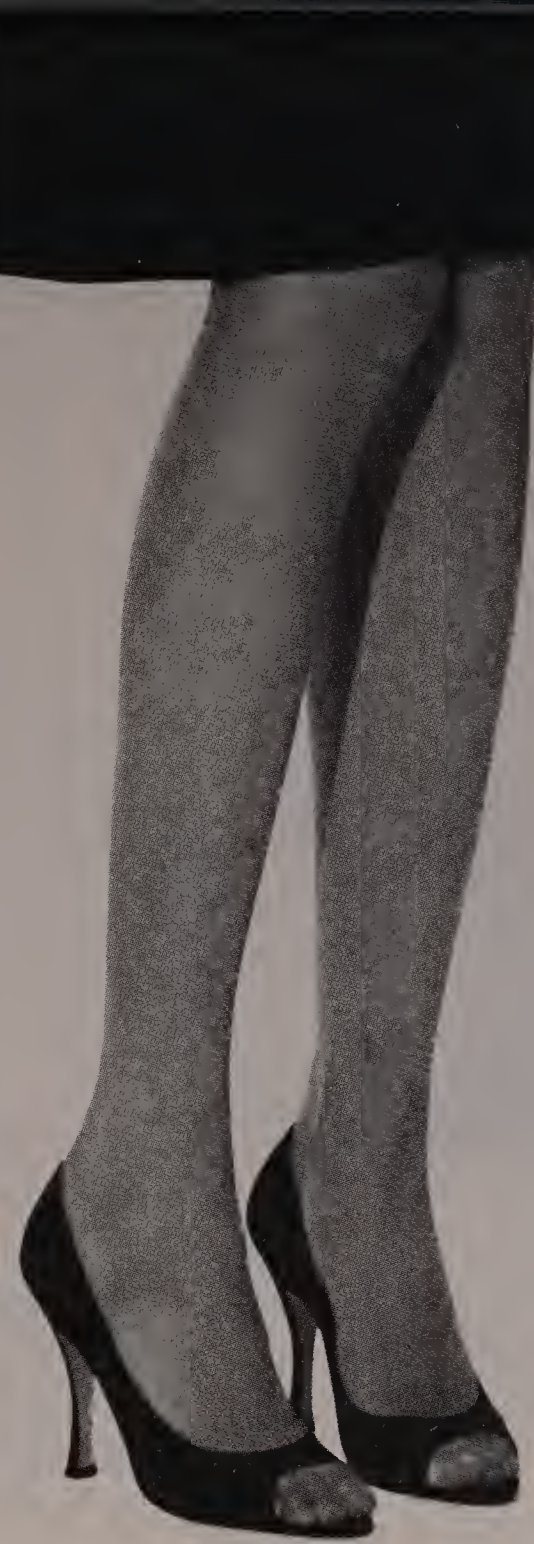


then resume editing in FrontPage. Oddly, FrontPage doesn't support Microsoft's own scrolling <Marquee> HTML extension and ActiveX applets.

FrontPage also comes with a couple of applets that give you complete control over multiple, complex Web projects. Like a digital Jeeves, the FrontPage Explorer copies embedded graphics to the directory you're creating your site in, lets you follow links from page to page while editing, and keeps a to-do list of unfinished pages. The Web Server lets you browse your in-progress pages with third-party browsers as you work.

FrontPage doesn't give you any help publishing pages to a remote server that isn't running Windows (why am I not surprised?). To get your pages published, you first have to export them from FrontPage's idiosyncratic directory into a single directory; from there you upload them to your Internet provider's server, using an FTP utility. FrontPage 1.1 $149; Microsoft, 206/882-8080; http://www.microsoft.com

READER SERVICE NO. 686

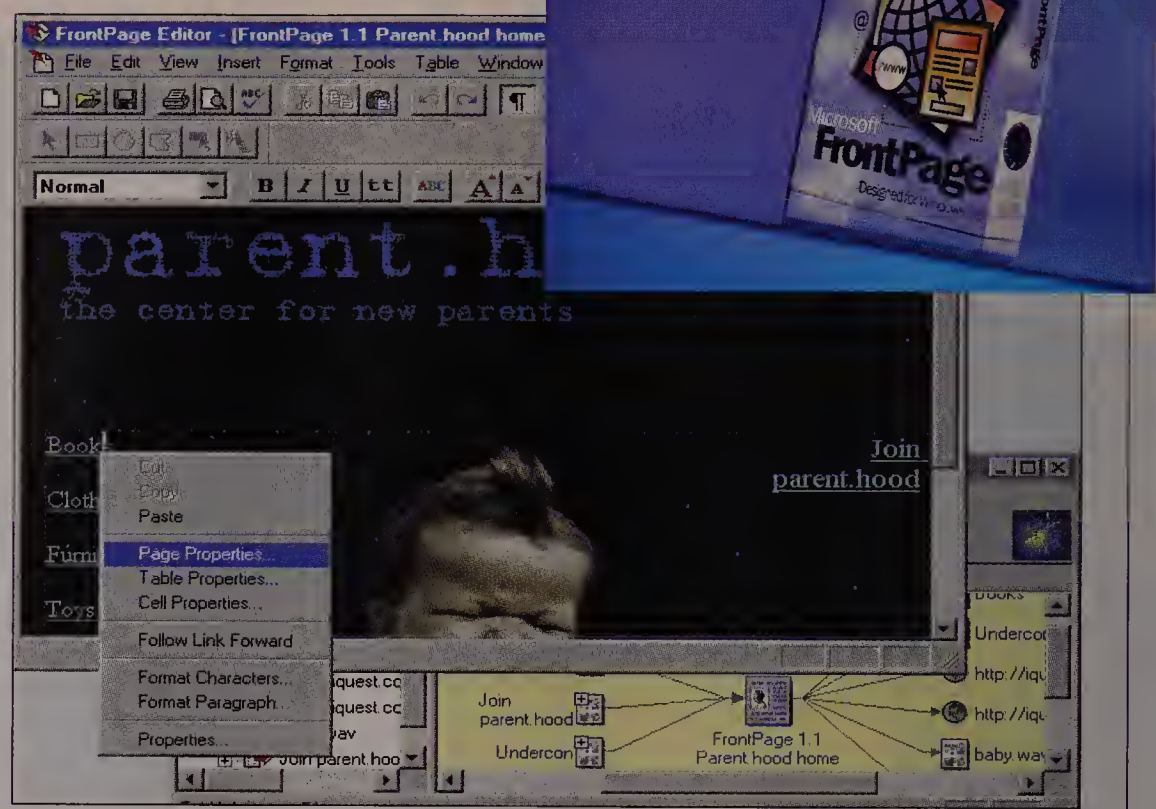
NETSCAPE NAVIGATOR GOLD 3.0

PRO: Easy table creation; UNIX server support

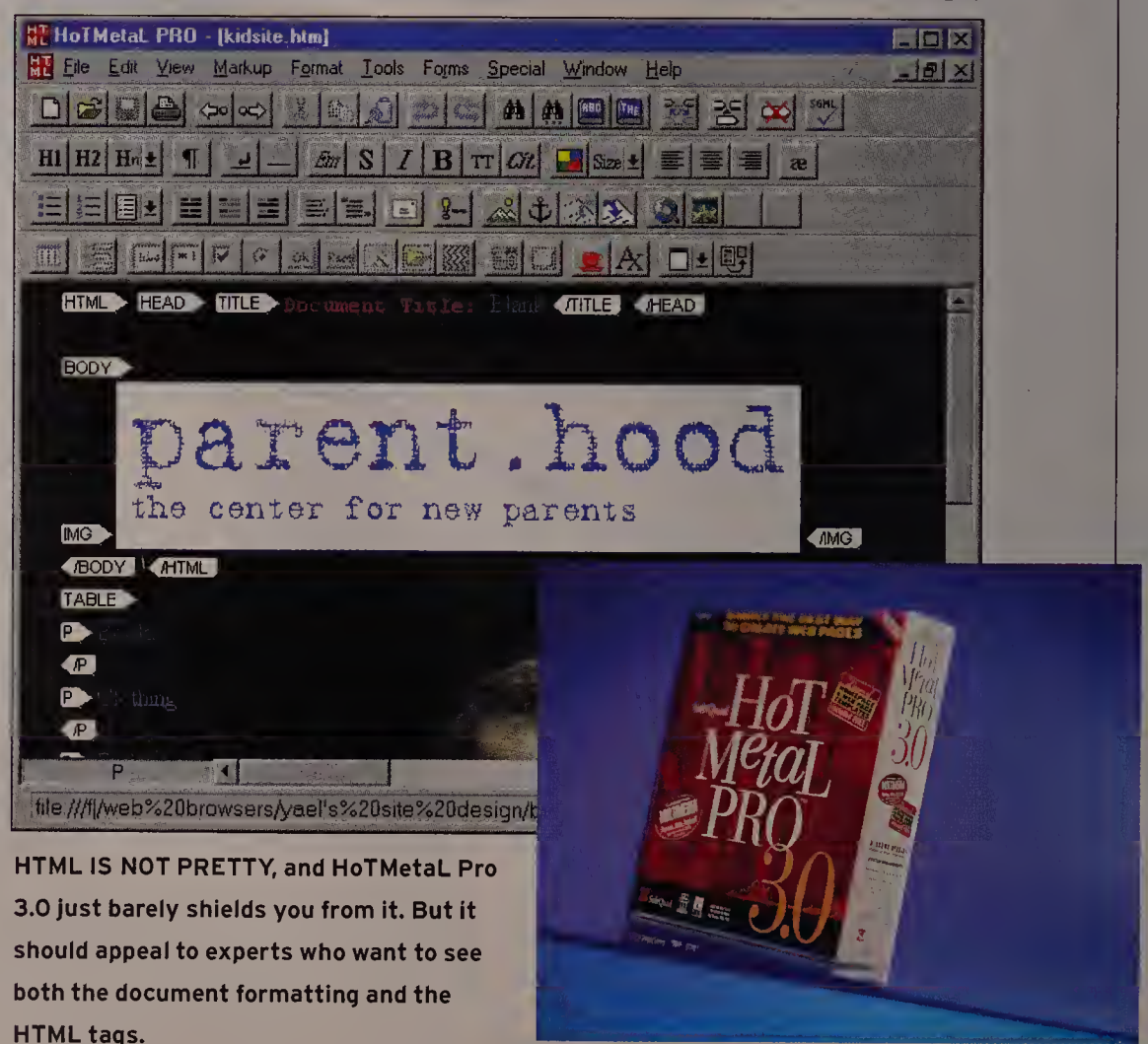
CON: No image maps or form tools; confusing multiple-window interface; documentation is stored on Netscape's server

NETSCAPE'S browser-cum-authoring program is about as graphical as they come. As with Backstage Designer and FrontPage, when you change a text or background color, insert a graphic, or add a rule, you'll see the results at once. And as with FrontPage, you right-click an object to see all its options. The program doesn't properly display text that wraps around graphics in edit mode, but a genuine Netscape browser preview is just a click away. Like its more popular browser-only sibling, Navigator Gold is free to educational and nonprofit users. This review is based on a prerelease copy of Navigator Gold 3.0. (International Data Group, the parent company of *PC World*, has a minority interest in Netscape Communications.)

I had no trouble re-creating the test pages almost exactly (inserting our sample JavaScript code was a breeze), but the program stopped me in my tracks when I tried to create image maps and forms, neither of which it supports at all. You'll either have to hand-code these or use another program like HoTMetaL Pro to add them later. Two other missing features didn't stop me from re-creating the test site but are conspicuous by their absence, nonetheless: Navigator Gold is the only program that lacks a spelling checker, and it doesn't help you ▶



MICROSOFT'S FRONTPAGE lets you see exactly how your pages and other files are linked. It works best with Windows 95- and NT-based Web servers.



HTML IS NOT PRETTY, and HoTMetaL Pro 3.0 just barely shields you from it. But it should appeal to experts who want to see both the document formatting and the HTML tags.

200MHz.

8X CD-ROM.

3.0GB.

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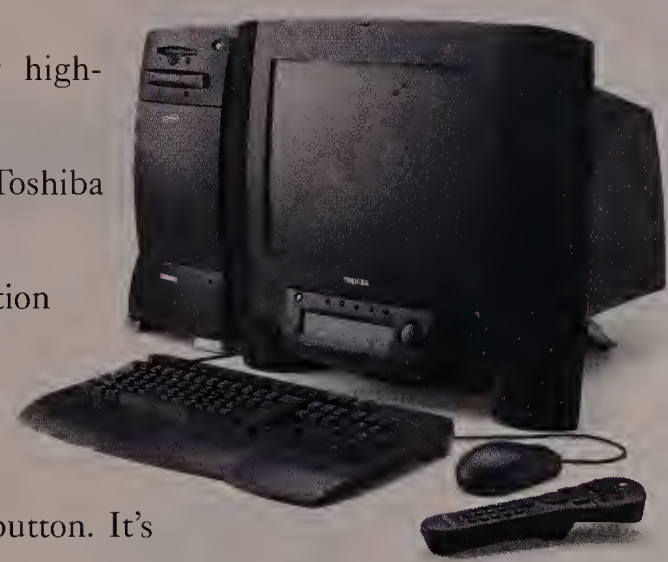
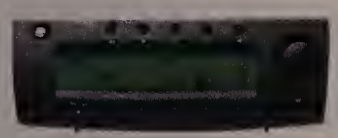
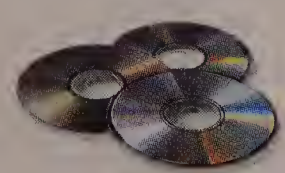


Tune in to Infinia™, the new high-performance home PC from Toshiba that lets you move from function to function with the touch of a button. It's designed to be right at home in your home – from its easy-to-use features to its sleek midnight-gray design. Then, there's the InTouch™ Module. A remarkable new device which makes computing easier than ever before. With just a button, for example, you can go from CD, to TV, to radio, to telephone or answering machine. It's that simple. Trade stocks online while you listen to the radio. Update your sales database as you watch the big game on TV, or talk to your dad in another city on the speaker-phone. In fact, Infinia offers so many advanced features, you won't believe your eyes. Simply turn the page and see for yourself. Plus, it's from Toshiba, the number one name in portable computers. To learn more about the Infinia, visit the Toshiba website at http://computers.toshiba.com or simply call us toll free anytime, any day at 1-800-457-7777.



Jump from CD to TV to radio to answering machine, each with the touch of a button.



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When you're ready for a different computer.

In Touch with Tomorrow
TOSHIBA

InTouch Module with LCD Display

Infinia 7200

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- *InTouch™ Module with LCD display and InTouch Remote*
- *Television tuner and FM radio card included*
  - *Full-motion live video capture and display*
  - *Cable TV reception in stereo*
- *Wave Table MIDI sound*

Infinia 7160

- *166MHz Pentium® processor*
- *16MB EDO DRAM, expandable to 128MB*
- *2 billion byte (=1.9GB) hard drive*
- *InTouch™ Module with LED display*
- *Television tuner and FM radio card optional*

Infinia 7130

- *133MHz Pentium® processor*
- *16MB EDO DRAM, expandable to 128MB*
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- *InTouch™ Module with LED display*
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- *Microsoft® Encarta® 1996 Encyclopedia*
- *Microsoft® Money*
- *Dow Jones Personal Journal®*
- *Quicken® SE*
- *America Online®*
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- *One year in-home warranty*
- *Supported by Toshiba's InTouch Center – 24 hours, 7 days a week*

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- *15" (13.78" viewable image)*
- *.28mm dot pitch*
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In Touch with Tomorrow
TOSHIBA

Designed for Microsoft® Windows®95

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create frames, one of Netscape's own HTML innovations. This feature was not used in our test site, however.

Like Backstage Designer, Navigator Gold helped me publish my finished pages to my Internet provider's UNIX server; unlike with Backstage Designer, however, I didn't have to go back and remove a bunch of slashes afterward. But both apps proved to have the same UNIX compatibility problem: They require that you enter the explicit path of your home directory on your Web server. And unlike a more full-featured FTP tool such as WS-FTP, Navigator Gold's publishing tool can't create directories on the remote system.

One last gripe: The help files are located on Netscape's server, which means you'd better be near a phone or have an Internet connection when things go wrong. If all you need is a simple, intuitive way to create basic pages, Netscape's low-cost program is hard to pass up. But if your requirements are just the least bit complex, Gold might as well be made of tin. Navigator Gold 3.0 $79; Netscape Communications Corp.; 415/937-2555; http://home.netscape.com

READER SERVICE NO. 687

NAVIGATOR GOLD'S FAMILIAR INTERFACE lets you easily create and format tables and page backgrounds, but you will need to look elsewhere if you want more advanced features.

SOFTQUAD HOTMETAL PRO 3.0

PRO: Broadest HTML tag support; HTML code checker; good image editor

CON: Quasi-WYSIWYG interface; cumbersome URL conversion before publishing; can't edit HTML source

HOTMETAL PRO can handle just about any HTML task—once you've figured out how to use it. This powerful tool's interface was a little daunting at first—four rows of buttons and a preview window with a little tag icon everywhere an HTML tag exists. Once I got the hang of it, though, I appreciated the way it displayed my tags in an otherwise graphical document view. For Web authors who know and love their HTML, this could be the best of both worlds—you can easily turn off the tags for a near-WYSIWYG view of your document.

The drawback is that you need to know HTML. Unlike with purely graphical programs, there's nothing to stop you from inserting HTML tags where they're not allowed, such as after the page's closing HTML tag—an error I committed on my first page. But thanks to HoTMetaL Pro's HTML verifier command, which checks for coding snafus, I was soon error-free. Like FrontPage, HoTMetaL has a multiple-document interface, so you can simultaneously create all pages of a Web site. The editor window doesn't display background images, but you can configure the toolbars to launch up to four different browsers to see how your page will look in a variety of settings.

> HoTMetaL Pro added an extra pair of quotes to the JavaScript applet, generating an error. It was easy enough to deduce once I opened the page in a text editor, but HoTMetaL Pro doesn't provide a way to edit or even view your source code.

HoTMetaL Pro was the only program that let me enter the two major types of scrolling text (<Marquee> and Java). For Navigator-supported scrolling text, HoTMetaL brought up a dialog box to paste in the JavaScript code. But there was a glitch: HoTMetaL added an extra pair of quotes to the JavaScript applet, generating an error. The problem wasn't visible in HoTMetaL's on-screen tags. What happened was easy enough to deduce once I opened the page in a text editor, but HoTMetaL doesn't provide a way to edit or even view your source code.

When it came time to post my site to a server, HoTMetaL gave me no help at all—not even a limited Windows-to-Windows transfer utility. The best it could offer was a command that converted explicit file paths (c:\myfiles\images\babe.jpg) to relative ones that any computer could understand (babe.jpg). But I had to repeat the command over and over again—a tedious chore. And if HoTMetaL had simply copied all relevant files to a single directory as the site was created —something the other three programs can do—the whole dumb task wouldn't have been necessary. HoTMetaL Pro 3.0 $159; SoftQuad Inc.; 416/544-9000; 416/544-0300 (fax); http://www.softquad.com

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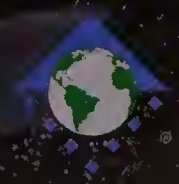

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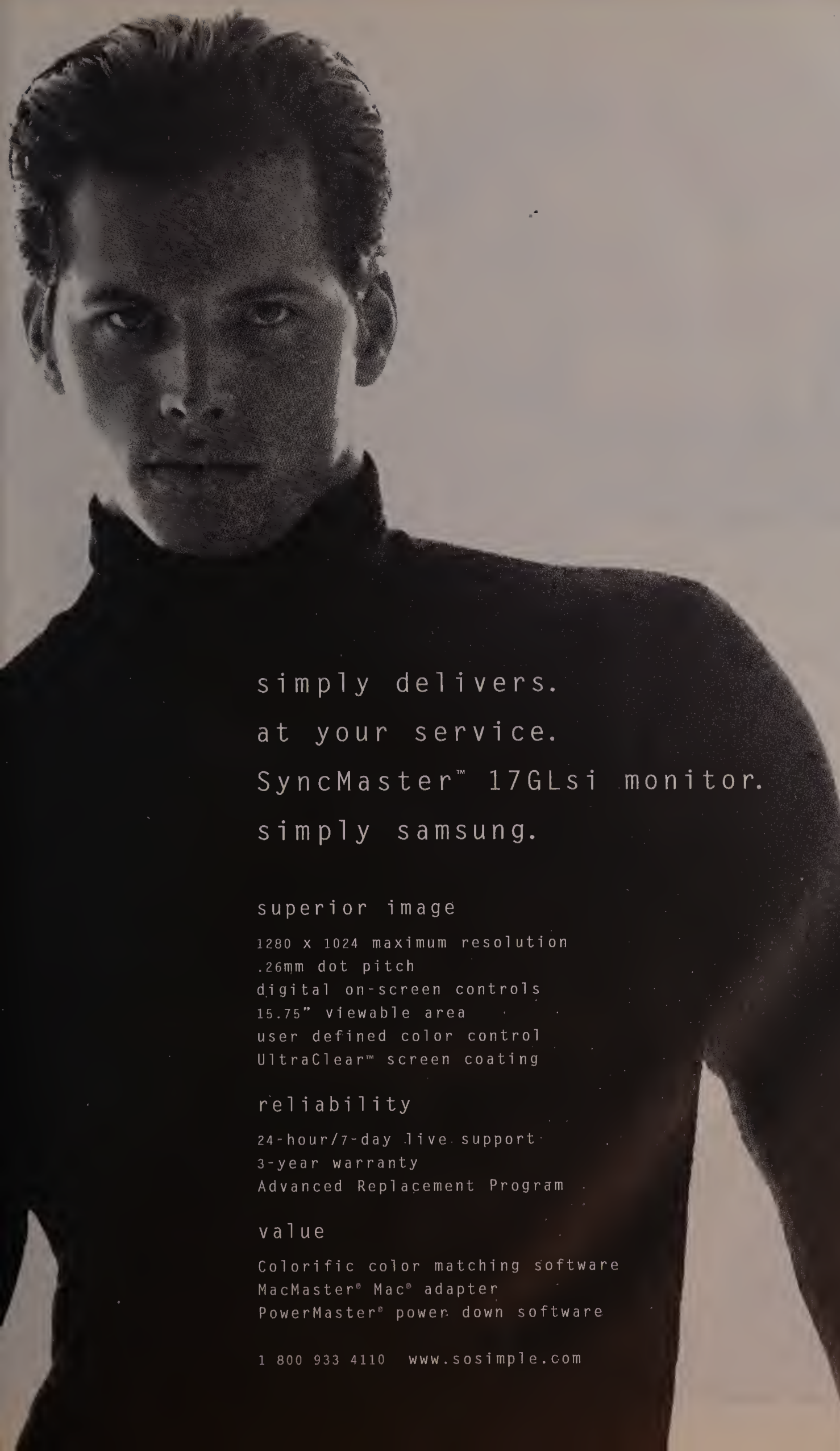

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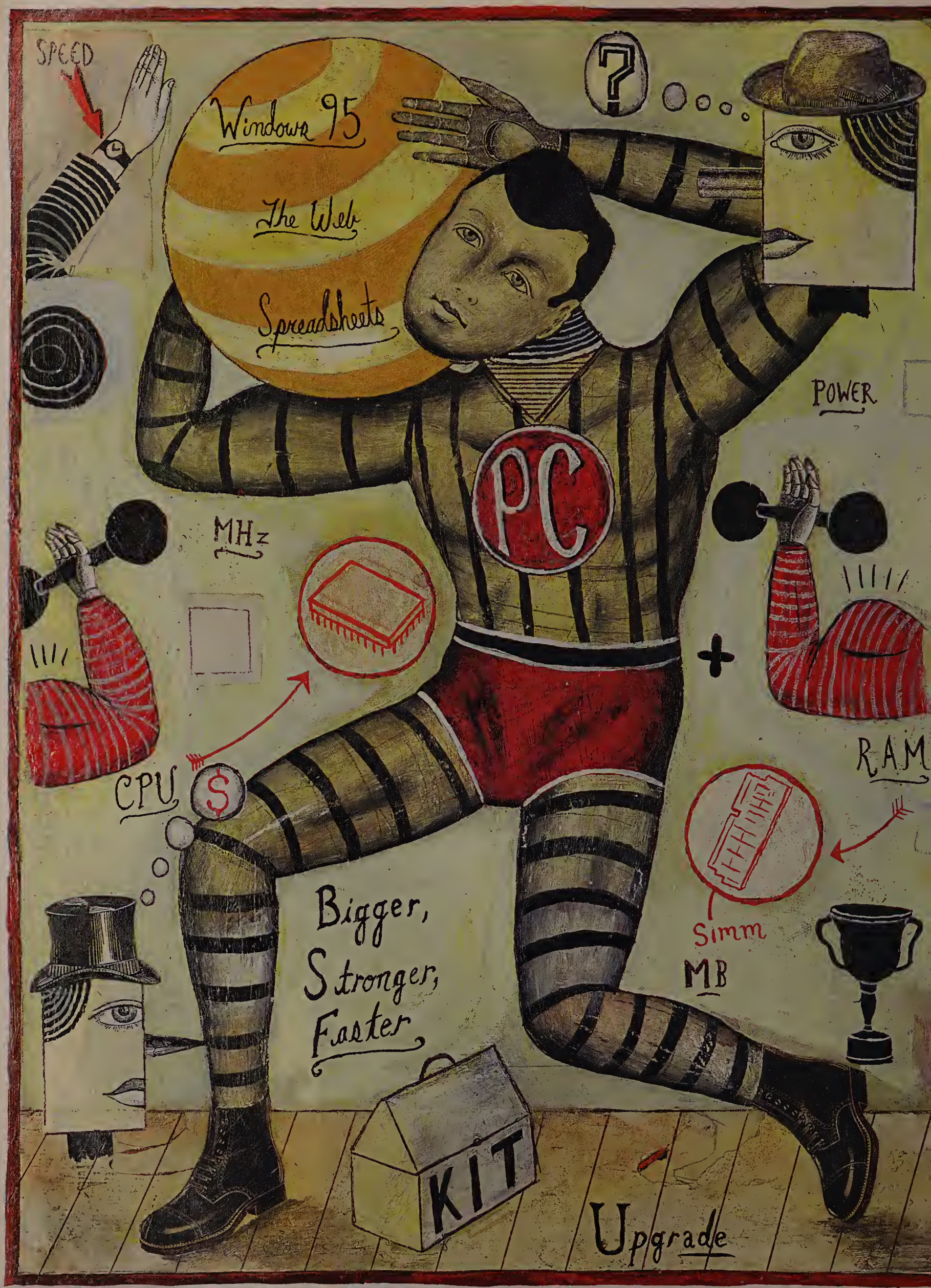
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Upgrade

Is it worth pouring money into an old PC to bring it up to date? Sometimes. Here's the scoop on when to upgrade and how to spend your upgrade dollars wisely.

Upgrades

The Best for the Buck

BY JEFF BERTOLUCCI

YOUR 486 PC—a computer barely functioning under the load of today's system-hungry software. We can rebuild it. We have the technology. We can make it better...stronger...faster! But is it worth turning your old workhorse into the $6 million bionic computer? It's a question millions of users face every day.

If you bought your computer more than two years ago, odds are you have a 486 with 4MB to 8MB of RAM. Back then, Windows 95 was merely a gleam in Bill Gates's eye, and the Web was something you cleared off the basement wall. Try to surf the Internet and run Windows 95 today on that 486—or even a Pentium-75—and you'll spend most of your waking hours staring at an animated hourglass.

Fortunately, memory and CPU upgrades can turn your aging machine into the Bionic PC. But which option is best for you? ▶

ILLUSTRATION BY CHRISTIAN NORTHEAST

The good news is, most RAM is dirt cheap these days. A year ago, 8MB of RAM cost more than $300; now the same amount is less than $100.

More RAM? A faster processor? Both? Or do you need a whole new system?

To answer these questions, we replaced the original CPUs in two 486-66 machines with Pentium-class processors from Evergreen Technologies, Gainbery Computer Products, Intel, and Kingston Technology, running our PC WorldBench test suite on the systems before and after the swap. Similarly, we installed Intel Pentium OverDrive processors in a pair of 75-MHz machines and two P-100s—boosting the CPUs' internal clock speeds to 125 MHz and 166 MHz, respectively—and then gauged the results.

To see if adding RAM boosts performance more than installing a faster CPU, we also tested the 486s with 8MB and 16MB and ran all four Pentiums with 8MB, 16MB, and 32MB. Finally, we combined RAM upgrades with new CPUs, then measured the performance bang against the extra cost. Our findings:

◆ For 486s, the combination of upgrading the RAM to 16MB and upgrading the CPU yields the best results. Our upgraded 486-66 PCs gained an impressive 48 percent speed boost, performing on a par with the average P-75 with 8MB of RAM. Depending on your 486's age and memory configuration, a RAM-and-CPU upgrade runs anywhere from $210 to $480.

◆ For Pentiums with 8MB of RAM, adding an extra 8MB is the best option. When we boosted system RAM to 16MB, test scores rose by about 29 percent. Not bad for an upgrade costing less than $100.

◆ For Pentiums with 16MB of RAM, the best upgrade is...none at all. Neither more RAM nor a Pentium OverDrive trip boosted test scores enough to justify the $350 to $610 price tag.

But performance isn't the whole story. To find out whether upgrading your CPU is as easy as the vendors claim, we brought in several unsuspecting PC users and asked them to install the new processors while we watched. We also conducted blind "taste tests" with selected users to gauge whether they could tell the difference between systems with extra RAM, a new CPU, or no upgrade at all. See "The 125-MHz Question." The results may surprise you.

Which Upgrade Is for You?

	The best upgrade is...	Why?	Cost
486SX or lower	a whole new system (Pentium or better)	Your motherboard is old, the hard disk is slow and low in capacity, and the graphics card is on its last legs. If you're planning to use Windows 95, there are no shortcuts for you.	
486 with 8MB of RAM (30-pin SIMMs)	to add 8MB of RAM	If you have 8MB, odds are both your memory banks are full, which means you'll have to discard your existing SIMMs and get 16MB worth of new ones. 30-pin SIMMs are hard to find and more expensive than their 72-pin counterparts.	
486 with 8MB of RAM (72-pin SIMMs)	to add 8MB of RAM and a new processor	The combination of 16MB of RAM and a CPU upgrade delivers the most bang for your buck. Our upgraded 486-66 test systems performed on a par with the average Pentium-75 with 8MB.	
486 with 16MB of RAM	a CPU upgrade kit	You won't get any performance boost from upgrading to 32MB.	
Pentium with 8MB of RAM	to add 8MB of RAM	The extra RAM delivers three times the performance boost of an OverDrive processor upgrade.	
Pentium with 16MB or more of RAM	none (save your money)	More RAM will provide minimal gains for Windows 95 users. An OverDrive chip would be too expensive to justify the minimal performance boost.	

RAM: THE SUPERIOR UPGRADE

THE BIG WINNER in our battery of tests wasn't the star of a multimillion-dollar ad campaign but the unglamorous yet sturdy RAM chip. Upgrading from 8MB to 16MB increased speed 22 percent on average for 486s and just over 29 percent for Pentiums.

This shouldn't surprise most users. If you've ever tried to load a word processor, a spreadsheet, and a Web browser into 8MB of memory, you

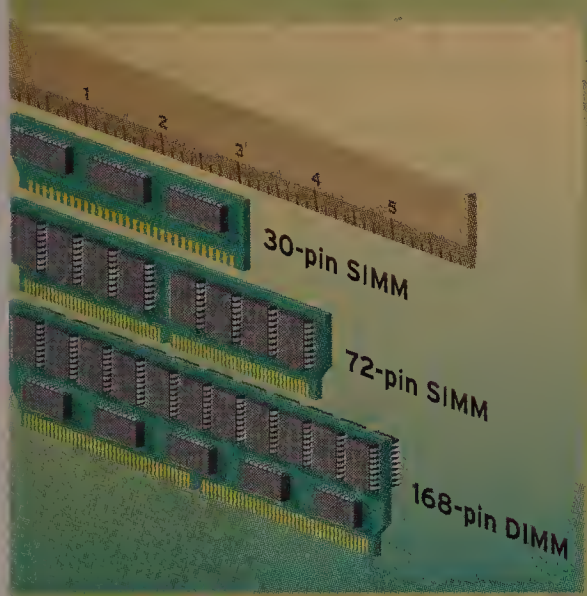
have probably listened to the hard drive buzz incessantly as the system slowed to a crawl. That's because Windows has used up all available RAM and is accessing virtual memory, a section of the hard disk where it stores data and instructions that won't fit in RAM. The more memory you have, the fewer trips Windows makes to the hard disk, and the faster your computer system performs.

So, if 16MB is good, 32MB must be much better, right? Wrong. When we upgraded our P-75s and P-100s from 16MB to 32MB, we boosted Windows 95 performance by only 3.4 percent. Unless you're crunching enormous spreadsheets or running apps that need 32MB or more—Windows NT, computer-aided design packages, and image or video editing software—stick to 16MB.

The good news is, most RAM is dirt cheap these days. A year ago, 8MB of RAM cost more than $300; now you can find the same amount for less than $100. The bad news? This windfall applies only to the 72-pin variety of RAM that comes in 486s and Pentiums sold since ▶

RAM SIMMplified

SIMMs? DIMMs? DRAM? EDO? SCHMEDEO? AAARGH!!! Figuring out which type of memory you need isn't as simple as, say, finding AA batteries for your Walkman. PC memory comes in a mind-numbing mix of shapes, sizes, capacities, and speeds—and it's very easy to buy the wrong RAM.



If you own a brand-name PC, your job is usually straightforward: Simply call a reputable memory vendor such as Kingston Technology or Insight Direct, and tell them your PC's brand and model. The company should be able to find RAM modules that fit your system.

But if you have a no-name clone or would rather buy RAM at a computer superstore or a high-tech swap meet, you've got to do your homework.

SIMMS VERSUS DIMMS

FOR STARTERS, you'll need to know whether your computer uses SIMMs (single in-line memory modules) or DIMMs (dual in-line memory modules). A SIMM or DIMM is a plug-in board with a number of RAM chips that fits into a socket on the motherboard. SIMMs come in 30-pin or 72-pin varieties, while the newer DIMM design has 168 pins. If you have a 486 PC, chances are high you're using SIMMS with either 30 or 72 pins. Pentium PCs typically use either 72-pin SIMMs or 168-pin DIMMs.

PINS? WHAT PINS?

THESE ARE tiny vertical gold bars at the bottom of the memory module. How do you know what you have? The easiest way to find out is to remove the PC's cover and grab a ruler or tape measure: A 30-pin SIMM is slightly over 3 inches long, while a 72-pin SIMM measures just over 4 inches. DIMMs are about 5 inches long.

NANOSECONDS COUNT

ANOTHER ISSUE is memory speed. Most of today's PCs use either 60- or 70-nanosecond RAM. If your PC requires 70ns RAM, it's okay to use faster 60ns chips—although you probably won't notice a speed increase. Don't buy RAM that's slower than required, because it won't work in your system. Not sure which speed you're using? Consult your PC's manual for technical specs, or ask your vendor.

IT'S IN THE BANK

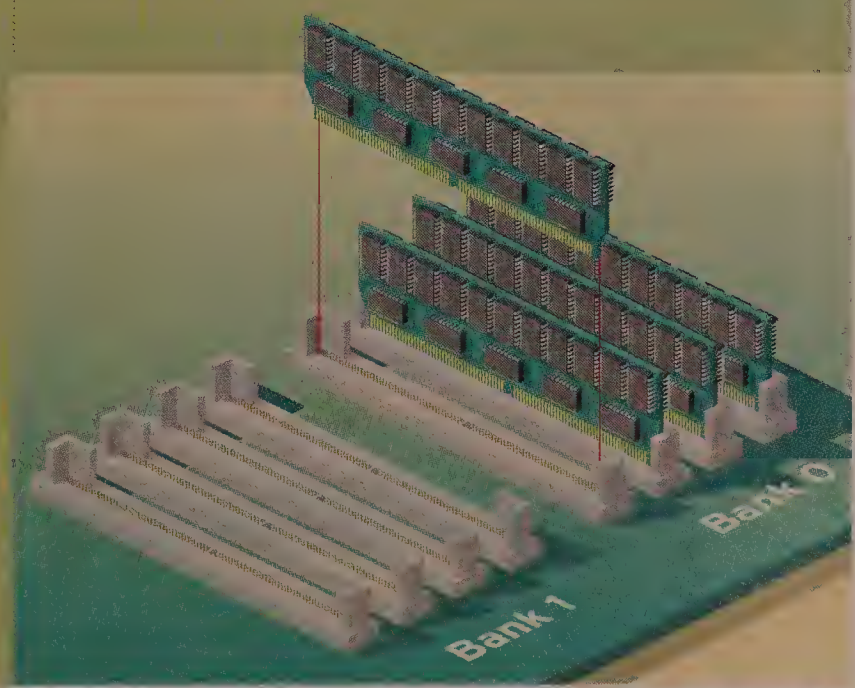
WHEN ADDING RAM modules to a PC, you'll need to fill an entire memory bank. On some motherboards, one bank can be four SIMM slots, while on others two SIMMs or one DIMM fill up a bank. If you can't tell by looking at the motherboard, check its documentation to determine what constitutes one memory bank in your PC. If all your memory banks are full, you'll need to throw away your existing RAM and replace it with higher-capacity SIMMs.

Note: You can't mix memory modules of different capacities, such as 1MB and 4MB SIMMs, in the same bank. However, if one bank contains, say, 1MB SIMMs, you can fill the other banks with higher-capacity modules.

THE NEW RAM

RECENT INNOVATIONS in dynamic RAM (DRAM) technology, such as extended data output (EDO) memory or synchronous DRAM (SDRAM), give newer systems an added speed boost. EDO reduces the amount of time it takes the CPU to read data from memory, while SDRAM increases performance by synchronizing memory speed with that of the processor bus. Both technologies are designed to work with the latest Pentium and Pentium Pro models, such as those that use Intel's Triton processor chip set. If your system doesn't support EDO or SDRAM (ask your vendor), look for standard SIMMs or DIMMs.

—Jeff Bertolucci and Yael Li-Ron



about 1994. Older 486s support an older, 30-pin type of single inline memory module that are now hard to come by and cost twice as much as the 72-pin type. Even worse, if all memory banks in your vintage 486 are filled with 30-pin SIMMs, you may have to toss out all your existing RAM and install new SIMMs. In that case, the cost of upgrading your RAM to 16MB could be as high as $280—almost as much as the cost of a new Pentium-75 motherboard with 72-pin SIMMs totaling 16MB of RAM!

FIVE EASY PIECES: A CPU upgrade kit usually contains 1 a box, natch; 2 a processor; 3 a heat sink (it often comes attached to the processor); 4 a demo disk, with varying degrees of usefulness; and 5 an illustrated manual, written in plain, nontechnical English—if you're lucky.

Before you go yanking out your motherboard—a task best left to a qualified technician—consider the other components in your system. You probably also want a bigger hard drive, a faster video card, and maybe a CD-ROM drive. If so, you're better off saving your money for a new PC. If you absolutely must upgrade your 486 and a new system is out of your budget, spend no more than $300. For more information on finding the right kind of memory for your computer, see "RAM SIMMplified."

A 486 IN PENTIUM CLOTHING

IF YOUR 486 is laboring under its load, take heart. CPU upgrade kits promise to bring Pentium-caliber performance to 486 systems. Typically, this means low-end Pentium performance, such as that produced by Intel's antiquated (in computer years) 75-MHz Pentium chip. Nevertheless, in our tests these processor upgrades boosted our Compaq and IBM DX2-66s by an average of 25 percent.

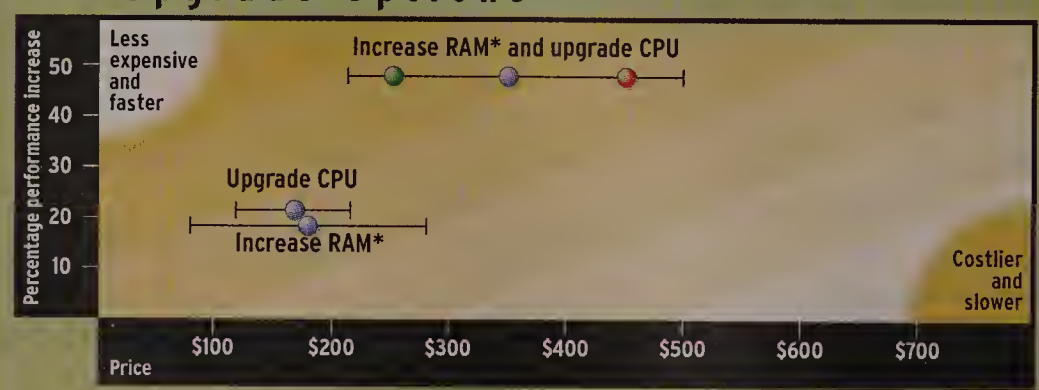
But did our upgraded 486s match the performance of a 75-MHz Pentium? Not quite. In fact, our 486s with 8MB of RAM were still 25 percent slower than the comparably-equipped P-75s we tested, making them closer to a 486/DX4-100 system in overall performance. Only after we boosted the upgraded 486s to 16MB of RAM did they produce on a par with some Pentium-75 systems with 8MB of RAM.

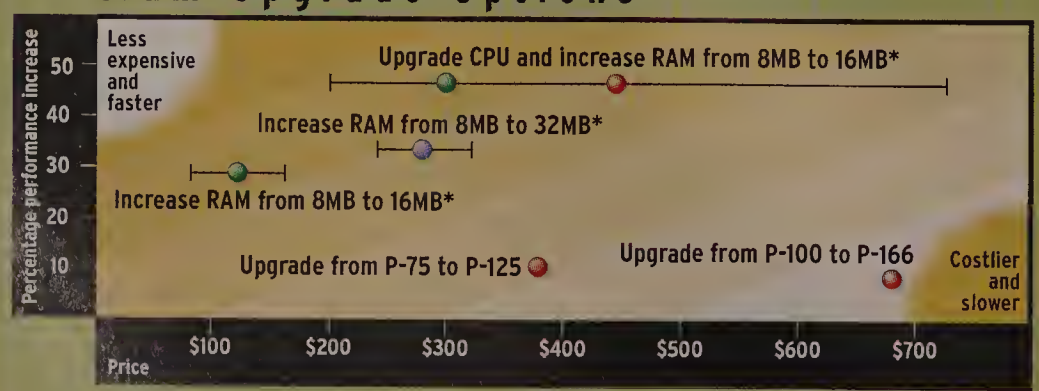
A variety of factors contributed to these lackluster results. For one thing, the typical 486 PC uses older (and slower) components than its Pentium counterpart. More important, the speed of the 486's bus—the rate at which the motherboard communicates with its components—is typically slower than the CPU. This is especially true when the vendor has squeezed more peformance from a system by doubling the speed of the CPU's internal clock. For example, our 486/DX2 has a CPU clock speed of 66 MHz but a bus speed of 33 MHz. When you replace the CPU with a 133-MHz processor, the bus still runs at 33 MHz.

Still, a 25 percent performance boost is nothing to sneeze at. Take a 486 CPU upgrade kit, which costs from $120 to $200, add $100 or so for 8MB of RAM, and you get a significantly faster system for about $300 or less. That's a pretty good deal. ▶

YOUR MONEY'S WORTH

ALL UPGRADES ARE NOT CREATED EQUAL. If you've got a 486 with 8MB of RAM, adding another 8MB and upgrading your CPU is usually your best bet. For Pentium owners, moving to 16MB is also a no-brainer. But don't bother replacing your Pentium's CPU: the minimal performance gain isn't worth the money.





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*Cost varies depending on type of SIMM or CPU upgrade.

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- Real-time video capture & MPEG1 playback
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TEST REPORT

CPU and RAM Upgrades

SYSTEMS	RAM (MB)	PC WorldBench score
Baseline DX2-66	8	64
with CPU upgrade	8	77
with 8MB added	16	76
with CPU upgrade, 8MB added	16	95
Baseline P-75	8	105
with OverDrive	8	116
with 8MB added	16	134
with 24MB added	32	138
with OD-125, 8MB added	16	154
with OD-125, 24MB added	32	158
Base P-100	8	106
with OverDrive	8	116
with 8MB added	16	139
with 24MB added	32	144
with OD-166, 8MB added	16	156
with OD-166, 24MB added	32	162

Word 7.0 for Windows 95
Excel 7.0 for Windows 96
Picture Publisher 6.0 for Windows 95
Paradox 5.0 for Windows
WordPerfect 6.0 for Windows
1-2-3 release 5 for Windows

HOW WE TEST We tested processor upgrade kits from Evergreen Technologies, Gainbery Computer Products, Intel, and Kingston Technology. Using 66-MHz 4B6 systems from Compaq and IBM, we replaced the original 4B6 CPUs with "Pentium class" processors from the four vendors, testing the systems before and after the swap. Similarly, on 75-MHz Pentiums from AST and Quantex, and 100-MHz Pentiums from Dell and NEC, we installed Intel Pentium OverDrive processors that boost the CPUs' internal clock speeds to 125 MHz and 166 MHz, respectively. We also tested the PCs under a variety of memory configurations, including BMB, 16MB, and 32MB of RAM. On the 4B6s, we tested with BMB and 16MB of RAM only. Higher PC WorldBench scores are better.

KIT AND KABOODLE

UPGRADE KITS for 486s come in a bewildering array of clock speeds and specs, but they basically fall into two categories: Intel and non-Intel. Intel's Pentium OverDrive for 486 is based on Pentium technology. By comparison, Evergreen, Gainbery, and Kingston use either AMD's or Cyrix's 5x86 processors, which, architecturally speaking, are more closely related to the 486 than to the Pentium.

All the kits offer a 16K or larger internal CPU cache, which aids system speed by storing recently used instructions or data; the Intel kit features a 32K cache. Both the AMD and Cyrix processors come with a "P-rating"—in theory, a measure of the chip's performance relative to the Pentium. But none of the P-75 kits achieved true P-75 performance. Although we tested only upgrades for 486-66 CPUs, each vendor has upgrade kits for a wide range of system configurations. For full product specs, see PC World Online (http://www.pcworld.com.nov96/upgrade.html).

The kits also vary widely in their compatibility with the universe of installed 486s. While we liked the Kingston processor best, thanks to its easy installation and low $129 price, compatibility will likely play the key role in determining which upgrade kit you choose. (See "CPU Upgrade Issues" for more information.) Here's how the kits line up.

Evergreen 586/133: This kit comes in two flavors—a $129 version that uses AMD's Am5x86 processor and has a P-75 rating, and a $159 model that uses Cyrix's 5x86 chip and comes with a P-90 rating. (To provide a direct comparison to the other vendors' P-75–rated kits, we tested the AMD version.) The Evergreen 586/133 comes with a heat sink and a 16K internal cache. It boosted performance by 13 percent on our Compaq 486-66 test system with 8MB of RAM, and by 21 percent on the same system with 16MB. Its scores were even higher on an IBM 486-66: a 26 percent increase with 8MB, and a 29 percent jump with 16MB.

Gainbery GB-586-133: Like Evergreen's 586/33, Gainbery's processor kit uses AMD's Am5x86 chip with a 16K internal cache and a clock multiplier. The $139 GB-586-133 also has a heat sink—a *huge* heat sink—so tall we couldn't install the chip properly on our IBM test system.

On our Compaq 486-66 with 8MB of RAM, the GB-586-133 hiked performance by 18 percent; oddly enough, with 16MB the boost was only 19 percent. On the IBM, the increases were 24.6 percent with 8MB and 30.6 percent with 16MB.

Intel's Pentium OverDrive for 486: Despite its Pentium core, larger cache, and higher price ($219), the 83-MHz OverDrive was no faster than the 5x86-based upgrade kits that we tested. On our Compaq, the OverDrive registered an 18 percent speed boost with 8MB of RAM and 20 percent with 16MB. On the IBM, the gains were 25 percent with 8MB of RAM and 29 percent with 16MB.

Kingston TurboChip 133: The $129 TurboChip, which also uses the Am5x86 processor, performed on a par with its competitors. It works with most—but not all—486 systems, including the lowly 16-MHz 486SX. However, the TurboChip won't work with 486s that use a 40-MHz system bus, including clock-doubled 80-MHz PCs and clock-tripled 120-MHz ▶

The 125-MHz Question

WHEN YOU PLAY the upgrade game, perception is as important as reality. Sure, test results may say an upgraded system is 20 percent faster, but can you really tell the difference? We decided to find out. So we brought eight PC users—four novices and four veterans—to our labs and invited them to play Spot the Faster System.

Each contestant worked with three machines: a 75-MHz Pentium with 8MB of RAM; a P-75 with 16MB; and a P-75 with 8MB that had been upgraded with a 125-MHz Pentium OverDrive, boosting its internal processing speed to 125 MHz. Because this was a blind test, the contestants didn't know which PC was which.

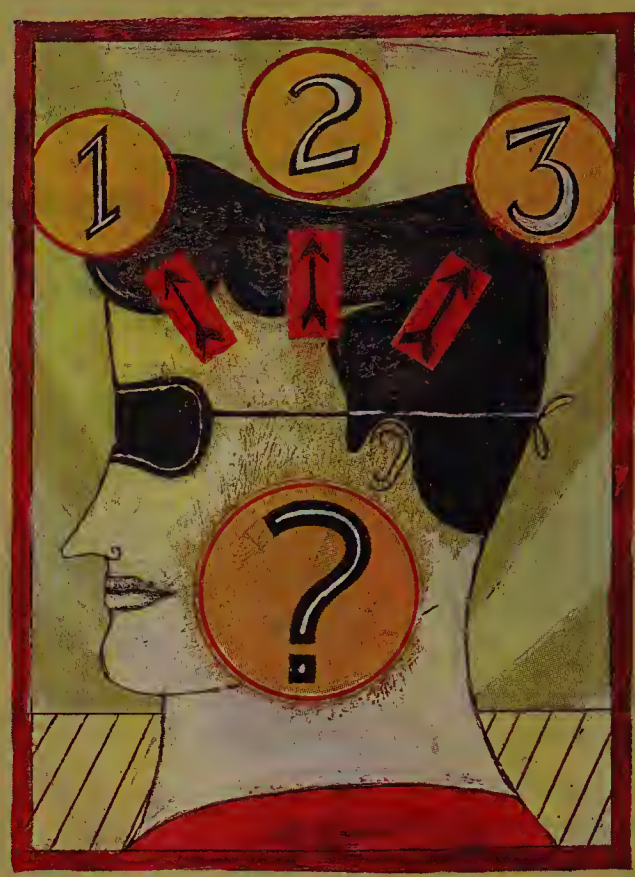
Their assignment? Perform standard computing tasks—using the search-and-replace tool in Microsoft Word, editing an Excel spreadsheet embedded in a Word document, and blasting baddies to smithereens in the hallways of Doom—and then tell us which PC they thought was faster.

In the grand tradition of *The Price is Right*, we also asked our panel to estimate the street prices of RAM and CPU upgrades. Although the dollar amounts varied wildly—from $35 for a new CPU to $1250 for 8MB of RAM—six users correctly guessed that the CPU upgrade kits were more expensive. And in fact, 8MB of RAM costs less than $100, while a 125-MHz OverDrive kit is about four times that—$379.

NO SURPRISES

SEVEN OF the eight testers picked the Pentium-75 upgraded to 16MB of RAM as the fastest system. Our test results confirm that this memory upgrade indeed yields the best results, boosting performance by a good 30 percent.

But when we pitted a P-75 with 8MB against the same system upgraded with the 125-MHz OverDrive, the results were surprising: Half the users believed the 8MB machine was faster than the one with the OverDrive chip! The OverDrive's 11 percent performance gain went unnoticed. The loser: the OverDrive upgrade kit.



Next came our tricky perception quiz: We asked our contestants which system they thought should be faster. Interestingly, half of them picked the PC with the 125-MHz OverDrive, and only three chose the true speed champ, the Pentium-75 with 16MB. (One was undecided.) One user voted for the OverDrive because "It's specially made to go faster." Obviously, Intel's Pentium commercials are paying off. The winner: Intel's marketing campaign.

To some users, pure system performance may be all that matters. But shelling out good money for an upgrade you won't even notice is surely the wrong way to play this game. —J. B.

units. On the Compaq with 8MB of RAM, the TurboChip boosted performance by 16 percent; with 16MB, the increase was 20 percent. On the IBM, the gains were 25 percent with 8MB of RAM and 31 percent with 16MB.

Bottom line: Though 486 upgrade kits are relatively affordable, a 25 percent performance boost is often not noticeable to the naked eye. If your 486 has 8MB of RAM or (shudder) less, a combination of RAM and CPU upgrade is your best route. See "Which Upgrade Is for You?" for details.

PENTIUM UPGRADES: MONEY FOR NOTHING?

A LOT HAS CHANGED since Intel introduced the Pentium more than three years ago. The first crop of Pentiums featured then-blistering clock speeds of 60 and 66 MHz. By comparison, the newest Pentium chip runs at 200 MHz.

Earlier this year, Intel introduced a series of Pentium OverDrives to bring its early models up to speed. Unlike the 486 upgrade products, which replace the original 486 chip with a faster CPU from another vendor or with Intel's own Pentium/486 hybrid, the Pentium-based OverDrives are true Pentium chips running at faster internal clock speeds. (Note: Evergreen's Pentium upgrades were not available for testing at press time.)

Bad news for Pentium owners: While the Pentium upgrade products cost considerably more than their 486 counterparts—from $379 to $679—they deliver less bang, as we discovered when we replaced a 75-MHz Pentium chip with a 125-MHz OverDrive, and a 100-MHz Pentium with a 166-MHz OverDrive.

Here are the sobering facts:

◆ The 125-MHz OverDrive increased P-75 performance by an average of just under 11 percent on our 8MB test systems. When we increased the RAM, the numbers grew slightly: a 14 percent gain with 16MB and with 32MB. Still, that performance is around the level of a typical Pentium-75 system with 16 MB of RAM.

◆ The 166-MHz OverDrive's test scores were equally yawn-inspiring: An average 9 percent performance gain on the 8MB systems, 12 percent with 16MB, and 12 percent with 32MB. The 166-MHz Pentium OverDrive does deliver on its promise: Its performance rivals that of an off-the-shelf Pentium-166 PC. But is a piddling 9 to 12 percent speed boost worth $610? We think not.

Unfortunately, we couldn't make an apples-to-apples speed comparison ▶

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Circle 91 on reader service card

Bad news for Pentium owners: while the Pentium upgrade products cost considerably more than their 486 counterparts, they deliver less bang.

with the 125-MHz Pentium OverDrive, which uses a rare "limited edition" 50-MHz system bus. The nearest off-the-shelf competitor, the 120-MHz Pentium PC, has a slightly slower internal clock speed but uses a faster 60-MHz bus. Even so, the 125-MHz OverDrive's $379 street price is too much to pay for a laggardly 11 percent performance boost.

Our recommendation: To upgrade a Pentium PC, you'd do better buying RAM (if it has only 8MB) or a new video card.

TRANSPLANTING YOUR CPU: PROCEED WITH CAUTION

NO MATTER WHAT upgrade you choose, you'll have to pop the hood on your computer and fool with the innards of a $2000 machine. Adding new RAM is like replacing the spark plugs in your ▶

Accelerate Your Display

THE RIGHT GRAPHICS CARD can mean the difference between productivity and frustration. To help figure out which graphics card is right for you, think of how you'd describe your computer to a friend. Now look here for a similar description and see if you've got the graphics card you need to get the best results. —Brad Grimes

YOUR PC IS...	You need	Get this
a dinosaur	If you own an older (vintage 1993 or 1994) 486 PC, you can probably use a VESA local bus graphics board. Unfortunately, most new graphics boards support PCI local bus. And if all you have are ISA slots, you could be out of luck—they don't make ISA boards any more. Look hard, though. Some retailers still carry both VLB and ISA boards.	• Diamond Stealth64 Video 3000 (VLB) with a minimum of 2MB of RAM ($269) • STB Velocity 64 Video (VLB) with 2MB of RAM ($269) • Diamond SpeedStar64 2000 (ISA) with 2MB of RAM ($199) • STB Nitro64 (ISA) with 2MB of RAM ($199)
a number cruncher	To see a lot of your large spreadsheet on the screen at once, get a graphics board that offers high resolutions and high refresh rates. Almost all boards support 1024 by 768, but not all refresh the screen fast enough to prevent flicker. Your board should support a refresh rate of at least 75 Hz at all the resolutions you plan to use.	• Matrox MGA Millennium ($269) • Hercules Terminator Professional ($279) • Number Nine 9FX Motion771 ($259)
a 1-hour Fotomat	For touching up photos, you need a board that can display 24-bit photo-realistic color (that's 16.8 million colors). Here, the difference is in the amount of memory.	• A board with 2MB (for displaying 24-bit color at resolutions up to 800 by 600). • A board with 4MB of VRAM or WRAM (for 1024 by 768; costs roughly $140 more than a 2MB board).
a multimedia cinema	To play full-motion video, your board should support color space conversion, which helps the video run without skipping frames; scaling, which lets you change the size of your video window without hurting video quality; and bilinear interpolation, which helps eliminate jagged edges on images. In addition, it should support DirectVideo for playing AVI movies on Windows 95.	• STB Lightspeed 128 ($199) • VideoLogic GrafixStar 600 ($159) • ATI Video Xpression ($173) • Hercules Dynamite 128/Video ($229)
a 3-D console	For killing bad guys in the latest game or browsing virtual worlds on the Web, you need a board that accelerates 3-D images. Some 3-D boards work in conjunction with your existing graphics board. Others, like the ones listed here, are 3-D *and* graphics boards in one.	• ATI 3D Xpression ($199) • Diamond Stealth 3D 2000XL ($179) • Number Nine Reality 332 ($199)

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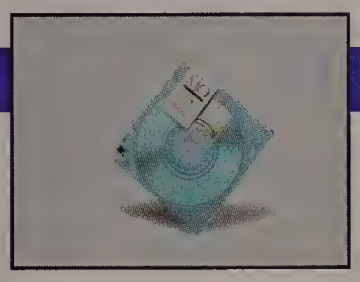

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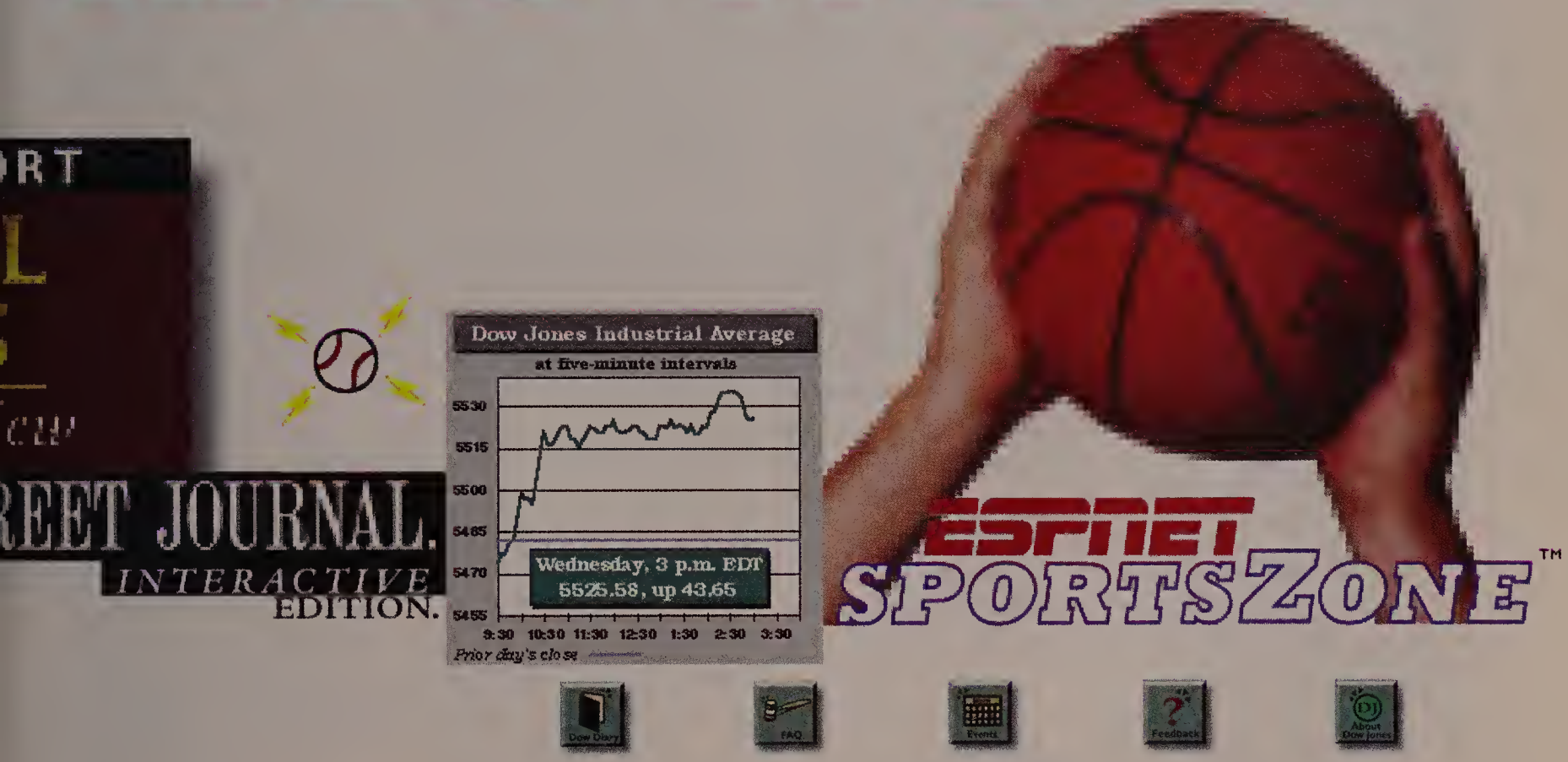

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car—once you get over the initial terror, it's usually pretty straightforward.

Adding a new processor, on the other hand, means handling the most expensive component of your PC's motherboard. All the CPU upgrade kits claim to be easy for novices to install. To find out if that was really true, we invited eight users to the PC World Usability Lab and asked them to roll up their sleeves and dig in.

Our jury consisted of eight users, all of whom had at least five years' experience using a PC. Their professional backgrounds varied from bookkeeping to designing energy-efficient lighting. Four users had previously installed internal components (RAM, hard drive, or video card); the other four had never removed the cover from a PC.

Using the CPU upgrade kits' directions as reference, each user had to upgrade the 486 CPU in a Compaq Deskpro and rate the ease or difficulty of the procedure. The kits we tested were from Evergreen, Gainbery, Intel, and Kingston. Each juror installed three of the four products in varying sequence. As in all usability testing, we videotaped the process and evaluated the users' struggles.

Problems appeared early on, even among the experienced jurors. Nearly everyone had trouble finding the CPU the first time they went looking. Instructions for all four upgrade products described how to identify a 486 chip by its logo, but none described the heat sink and fan that covers the chip. Evergreen addressed this problem best. Its manual said the CPU was about 1.75-inches square—a very helpful identifying tool.

Several testers were also baffled by the release lever on the zero insertion force socket, though each product's instructions made at least passing mention of it. One

CPU Upgrade Issues

SO YOU'VE DECIDED that a CPU upgrade is the right choice. Now what? Buy the chip, pop open the PC, flip a lever, swap the chips, and you're done. Right?

Well, sometimes. First, you've got to determine whether the upgrade kit you want is compatible with your system—or, if you have an older 486, whether the CPU is upgradable at all. These are some of the questions to consider before starting.

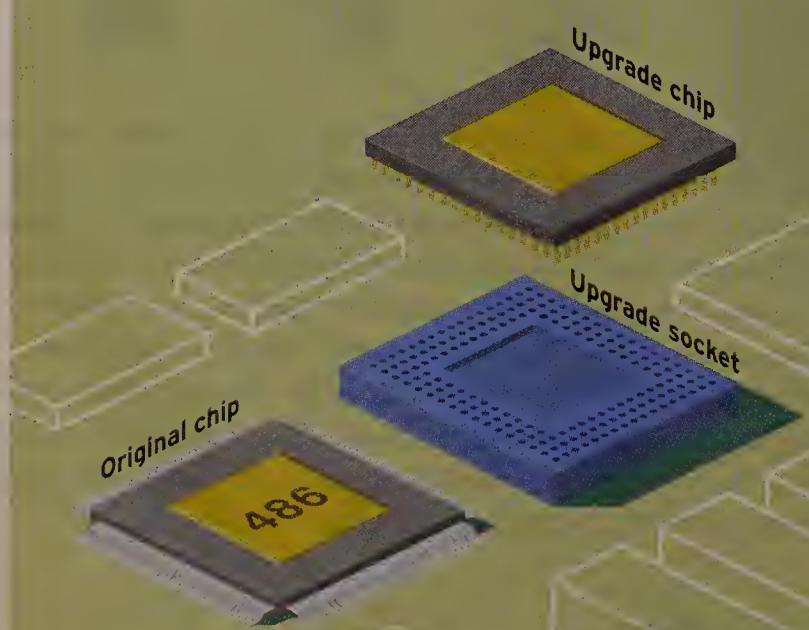
DOES MY BIOS SUPPORT THE NEW CPU?

THE BASIC input/output system is a set of instructions your computer uses to control the keyboard, monitor, disk drives, and certain system functions. Before you order your upgrade kit, you need to know whether your BIOS will support the new CPU. If your PC is a brand-name system such as Compaq or Dell, just note its model, then call the upgrade kit vendor (or check its Web site) to see if the kit works with your system. If you're not sure which BIOS you have, try pressing one of the following key combinations while your system is booting: <Ctrl>-<Alt>-<S>; <Ctrl>-<Alt>-<Esc>; <Delete>; <F10>; <Alt>-<F10>.

When you find the combination that works on your system, you'll be in a setup menu, where you can note the BIOS type and version. Caution: Don't make any changes while you're in the setup menu. Just note the information you're looking for, then follow the on-screen prompts to exit.

You can also download the file et9604.exe from PC World Online. It's a DOS-based diagnostic tool that identifies many common CPUs and BIOSes.

If you have an incompatible Flash BIOS, you should be able to upgrade it by downloading software from your PC vendor's Web site or BBS. If your system is three years old or older, you probably don't have a Flash BIOS and will need to replace the BIOS chip itself. In that case, your best options are either to replace the whole motherboard, which will come with a new BIOS and CPU, or to buy a new PC.



WILL MY NEW CPU FIT INTO THE SOCKET?

IF YOU'RE planning to replace your 486 processor, make sure the CPU socket is compatible with the new processor. Unfortunately, 486 CPU sockets come in a confusing mix of shapes and sizes, and there's no guarantee that you can upgrade. For example, in some 486s, the CPU is soldered to the motherboard—and there's no OverDrive socket. If this describes your system, you're out of luck; your PC won't support a processor upgrade. In other 486s, the CPU is soldered to the motherboard and sits next to an empty OverDrive socket. In these systems, you leave the original CPU alone and install the upgrade chip in the empty socket.

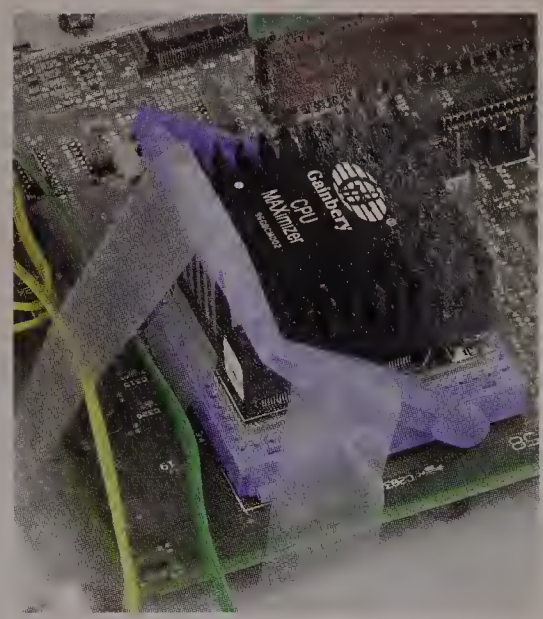
To confuse matters further, some motherboards have either a 168- or 169-pin socket, while others have either a 237- or 238-pin socket. How can you tell the difference? If there are three rows of pinholes around the processor, it's a 168- or 169-pin socket. Four rows indicate a 237- or 238-pin socket.

If you're a Pentium owner, you don't have to fret over sockets. Simply swap your

tester placed the Gainbery 586 chip on top of the existing 486 CPU, not realizing the native chip must be removed before installing a replacement. A second user misaligned the Gainbery upgrade chip and struggled at length to figure out why the system would no longer boot.

Overall, the Intel OverDrive83 and the Kingston TurboChip 133 kits received the highest marks, thanks in large part to their clear and amply illustrated instructions. The Intel kit got nods for its disk-based animated tutorial, which users viewed before disassembling their systems. Most testers also liked the Evergreen 586 Processor Upgrade kit, - though its documentation was ambiguous in spots. "It gave examples of other sockets but not of the ZIF socket with the [lever] on it. I wasn't sure what I was supposed to do," commented one tester.

Despite the varying degrees of frustration with the upgrade kits, all of our testers eventually succeeded in their mission. As for the *PC World* test crew, we encountered our own usability headaches when running our performance benchmarks. The IBM 486, for example, featured a socket with a three-sided lever that wouldn't close over the tall heat sink on the Gainbery upgrade chip. Our MacGyver-like solution: Scotch tape.



LOW-TECH SOLUTION: The only way we could fit the Gainbery upgrade chip into the IBM motherboard was with Scotch tape.

Bottom line: If you are going to perform brain surgery on your PC, set aside several hours to do it, just in case there are complications.

TO UPGRADE OR NOT?

UPGRADING A PC can send your productivity through the roof. It can also waste time and money. It all depends on your system and on the upgrades available.

If your 486 is too old, you'd probably be better off buying a new system. If your Pentium already has 16MB of RAM, a CPU upgrade may give too little bang for the buck. A simple rule of thumb: With new Pentiums starting around $1500 these days, it doesn't make sense to spend more than $300 on an upgrade.

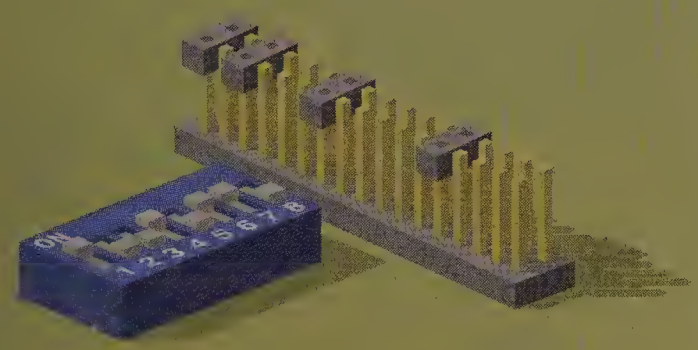
For files mentioned in this article, visit PC World Online at http://www.pcworld.com. Jeff Bertolucci is a freelance writer living in Denver, Colorado. Associate Editor Brad Grimes, Senior Editor Yael Li-Ron, Assistant Editor Aoife McEvoy, and Usability Testing Manager Susan Silvius also contributed to this article. Performance tests conducted by Ulrike Diehlmann of the PC World Test Center; usability testing run by Jeff Kuta. ■

existing Pentium CPU for an OverDrive chip.

WHAT ABOUT JUMPERS AND SWITCHES?

IF YOU'VE EVER installed a modem, SCSI board, or other internal hardware, you know what a royal pain jumpers and switches can be. What are they? *Jumpers* are very small pairs of pins. Some upgrade products require you to reconfigure the jumper settings on the upgrade kit or on the motherboard. Configuring jumpers involves moving tiny connectors between pairs of pins. These settings are rarely labeled on the board, so be sure to refer to the upgrade kit's manual.

Switches are small devices fastened to either the motherboard or the add-in board, each with a tiny lever you flip to choose a specific setting. Some motherboards, for instance, have switches that let you choose processor speed, voltage setting, and OverDrive processor name. Check with your PC vendor or the upgrade kit manufacturer to see if you'll need to flip any switches during installation.



HOW DO I REMOVE THE CPU?

THERE ARE two common types of processor sockets: the ZIF (zero insertion force) socket, which has a handle, and the LIF (low insertion force) socket, which doesn't.

With ZIF sockets, removing the original CPU is a snap—just flip up the lever and gently remove the chip. With LIF sockets, use a chip-removal tool that may be in the upgrade kit as well as in standard computer kits; computer kits (available in computer stores) include all the necessary tools for most common systems. —J. B.

Upgrade kits

Evergreen, 541/757-0934, http://www.evertech.com
READER SERVICE NO. 816

Gainbery Computer Products, 800/825-7331, 905/415-0480, http://www.gainbery.com
READER SERVICE NO. 817

Intel, 800/538-3373, 503/264-7000, http://www.intel.com
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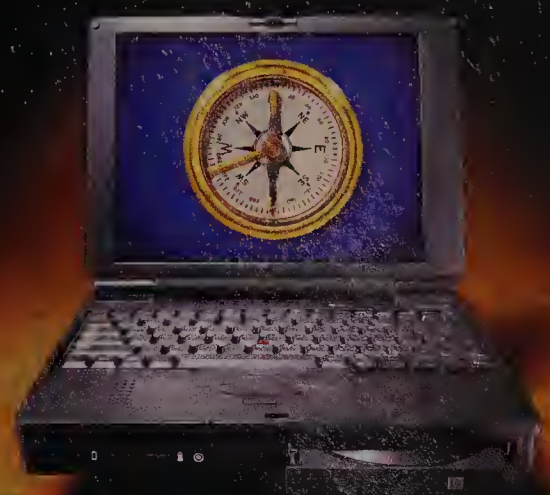

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HACKED!

ARE YOUR COMPANY FILES SAFE?

BY JEFFREY ROTHFEDER

Theft and destruction of company files is increasing faster than the ability to stop it. Is your company next? And what can you do to protect it?

FOR CITIBANK, IT WAS A PAINFUL REMINDER that a new Cold War was raging. During a series of digital raids in late 1994, Russian hacker Vladimir Levin and some accomplices allegedly sat at computers in the offices of a small software company in St. Petersburg and electronically transferred $11 million from Citibank's New York–based mainframes to Finland, Israel, and California.

Perhaps the most frightening aspect of these episodes is that they occurred under the watch of Citibank's well-regarded chief information officer, Colin Crook. Despite his ironic name, he has been given high marks for upgrading the bank's aging computer systems and making them among the most up-to-date and secure in U.S. business. ▶

PHOTOGRAPHY BY WILLIAM DUKE

Citibank officials won't discuss the case, which has yet to go to trial in the United States, except to say that they discovered the theft after the first $400,000 was stolen. They then informed the FBI, thereby limiting the bank's liability to that amount. But the brash robbery is mentioned in corporate and computer circles virtually every time a company discusses some new online banking or Internet commerce scheme.

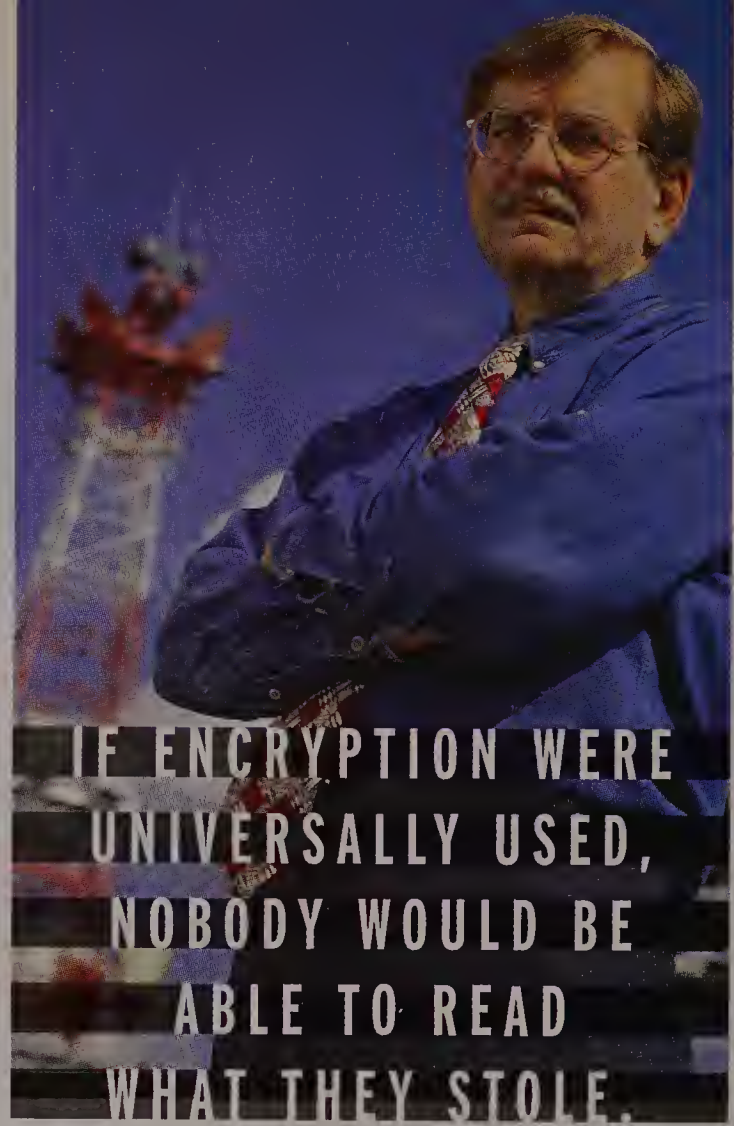
"Believe me, an attack like that paralyzes a company, or at least makes you think twice before plugging in another computerized service," says a Citibank security vice president, who asked not to be named.

There are no easy answers. Yet more and more corporations are relying on the Internet and private networks for conducting business and communicating with employees on the road or at external sites. And that trend has vastly increased the chances that a company will fall victim to high-tech disasters—everything from computer viruses to data theft to hardware breakdowns.

Despite the efforts of many corporations to beef up security measures, the number of electronic crimes is increasing more rapidly than the ability to stop them. In a survey of U.S. corporations conducted earlier this year by the San Francisco–based Computer Security Institute and the FBI, 53 percent of 428 respondents said that they had been victims of computer viruses, and 42 percent acknowledged that unauthorized use of their computer systems had occurred in the prior 12 months.

What's more, nearly half of those incidents were blamed on outsiders, usually entering through the Internet. Among the companies recently victimized: America Online, Boeing, Intel, Netscape Communications, Rockwell International, and Sun Microsystems.

The scope of the problem is probably far larger than the survey suggests. To avoid scaring off customers and provoking shareholder complaints, most companies don't tell the authorities that they've been targets. Several British financial institutions, including the Bank of London, have even paid hackers a total of more than a half-million dollars to keep mum about recent computer break-ins, says the *London Times*. The American Society for Industrial Security estimates that high-tech crimes, including unreported incidents, may be costing U.S. corporations as much as $63 billion a year.



IF ENCRYPTION WERE UNIVERSALLY USED, NOBODY WOULD BE ABLE TO READ WHAT THEY STOLE.

NOEL MATCHETT, INFORMATION SECURITY

NO PLACE TO HIDE

IT'S NOT JUST private companies that feel the sting. The U.S. Department of Defense is attacked some 250,000 times each year, according to a Pentagon study that simulated computer crimes to test the vulnerability of military networks. Only about 1 in 500 of these security breaches is detected and reported, the DOD estimates. The incidents include stealing or destroying data, disabling protection systems, and shutting down entire networks. Ironically, many of these intrusions are launched by hackers entering through the Internet, which the Pentagon created more than two decades ago as a communications system that would be invulnerable to even a nuclear attack.

One of the most daring attacks on the Pentagon computer systems occurred in mid-1994, when hackers attached so-called sniffers—software programs that monitor information as it flows across a network—to data switches that connected Rome Laboratory, the Air Force's top command and control research facility, to the Internet. The hackers scanned the information for passwords and used them to gain access to Rome's network, linking it to foreign Internet sites and stealing tactical and artificial-intelligence research.

"We need the equivalent of the Manhattan Project to help us harden our data infrastructures against attack,"

THE PRICE OF SECURITY

DATA SECURITY is not cheap, but considering the possible consequences of doing without it, there's no doubt that some sort of measures are necessary. The cost of an effective computer security plan for a company with 50 workstations in a local area network plus a Web site will average nearly $100,000.

$1,250	Smart card-based password system, $25 per log-in
$5,000	Antivirus software, $100 per workstation with site licenses
$15,000	Firewall to protect the internal network and e-mail and Internet connections
$75,000	Encryption hardware and software—usually a card, but sometimes a stand-alone box, at $1,500 per workstation
$96,250	TOTAL PRICE FOR SECURITY SYSTEM

ADDITIONAL COSTS MAY BE INCURRED TO MONITOR AND MAINTAIN THE SYSTEM.

PHOTOGRAPH: JIM FLANIGAN

HOW TO PROTECT YOUR DATA

NOBODY'S DATA is completely safe. But everybody's computer can still be well guarded against would-be attackers. Here's your arsenal:

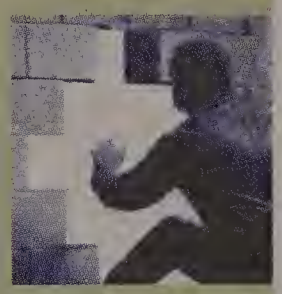
PASSWORD PROTECTION

At minimum, each time they log on, all PC users should be required to type in a password that only they and the network administrator know. PC users should avoid picking words, phrases, or numbers that anyone can guess easily, such as a birth date, a child's name, or initials; instead they should use cryptic phrases that combine uppercase and lowercase letters, such as "The moon Also RISES." In addition, the system should require all users to change passwords every month or so and should lock out prospective users if they fail to enter the correct password three times in a row.

VIRUS CHECKERS

Viruses generally infect local area networks through workstations, so antivirus software packages that work only on the server aren't enough to prevent infection; ideally, all terminals on the network—personal computers as well as dumb workstations—should be protected individually.

FIREWALL



These are gatekeepers made of hardware and software that protect a computer network by shutting out unauthorized people and letting others go only to the areas they have privileges to use. Firewalls should be installed at every point where the computer system comes in contact with other networks—including the Internet, a separate local area network at a customer's site, or a telephone company switch.

ENCRYPTION

Even if intruders manage to break through a firewall, the data on a network can be made safe if it's encrypted. Many software packages and network programs—Microsoft Windows NT, Novell NetWare, and Lotus Notes, among others—offer add-on encryption schemes that encode all data sent on the network. In addition, companies can buy stand-alone encryption packages to work with individual applications. Almost every encryption package is based on an approach known as public-private key. Scrambled data is encoded using a secret key unique to that transmission. Receivers use a combination of the sender's public key and their own private encryption key to unlock the secret code for that message and decipher it. One scheme, PGP, for Pretty Good Privacy, has become an almost de facto standard since it was first offered in 1991 as free software by its creator, Phil Zimmermann.

AUDIT TRAILS

Almost all firewalls, encryption programs, and password schemes include an auditing function that records activities on the network. This log—which, ironically, is turned off by many network administrators who don't appreciate its importance—is an excellent way of recording what occurred during an attack by hackers. The audit trail not only highlights points of vulnerability on a network, but can also identify the password and equipment used to invade the system during an inside job. In addition, this auditing log can prevent internal intrusions before they occur—when employees know such a trail exists.

SMART CARDS AND BIOMETRICS

Although probably useful only to companies with ultrahigh security, smart cards are safer than passwords for verifying authorized users. These credit card-size devices generate random numbers about every minute, in sync with counterparts on each entry point in the network. To log on to a computer, people enter a password and the number that appears on the smart card's LED window. This works well as long as the card isn't stolen. For even better protection, you should consider using biometric devices—which verify identification by scanning thumbprints, retinal patterns, and even the lines on a person's face.

said U.S. Deputy Attorney General Jamie Gorelick, speaking last February at a government conference, National Security in the Information Age.

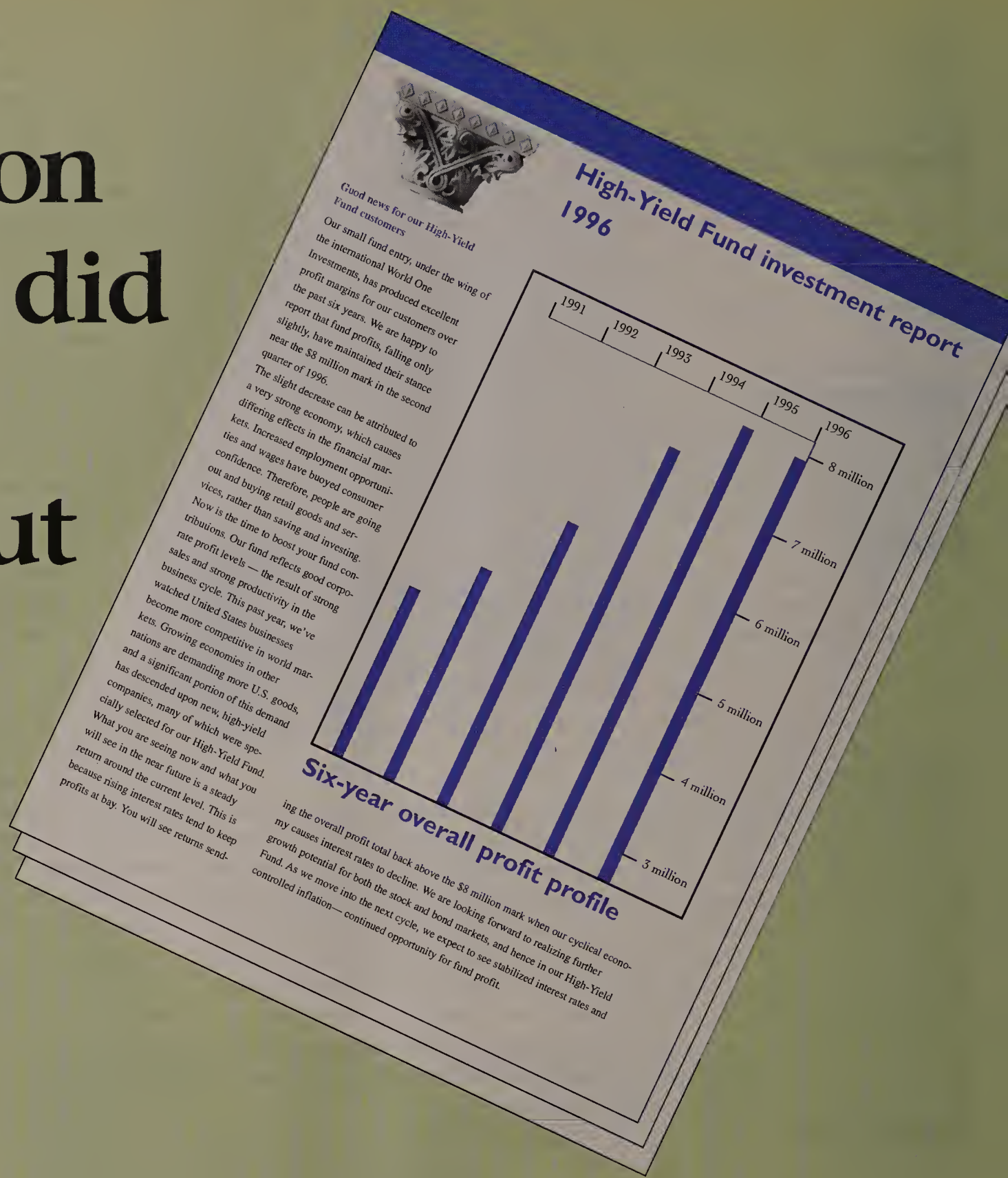
BUT WHAT CAN WE DO?

"THERE'S NOT A WEEK goes by that I don't get a phone call from other companies asking one question: How can it be avoided?" notes the anonymous Citibank executive. These days, the solution starts with software known as a *firewall*. This is essentially a gatekeeper that checks the password and other identification of anyone attempting to gain access to a network from the outside. It keeps unauthorized people out and "escorts" those with privileges to the parts of the network they're allowed to use. For instance, a firewall may allow employees dialing in through an outside laptop to download marketing reports, but bar the same employees from accessing customer lists because they don't have rights to that data. Or it may completely reject people using computers that don't match the corporate standard (such as Macintoshes or XT PCs in a Pentium PC environment).

The best firewalls also don't allow incoming messages to touch the rest of the network. That's important because a favorite trick of hackers is to install malicious code in e-mail sent via the Internet. When the network scans the e-mail to determine where to distribute it, the errant code tells it to take an action such as adding a new name and password to the system. A hacker can then use this password to slip through the firewall and gain entry to the network at any time. By segregating the e-mail system, a good firewall thwarts intruders from sending the high-tech equivalent of damaging subliminal messages.

It's important to put firewalls at every critical juncture where the network is exposed to the outside world—such as an Internet connection or a switching node that links the local area network to a wide area network. At $15,000 or so per site, firewalls can be expensive, but cost hasn't deterred a lot of companies from using them. About 45 percent of 1271 companies responding to a 1995 survey by Ernst & Young have installed firewalls. At such high prices, though, few companies ▶

The person who did this layout



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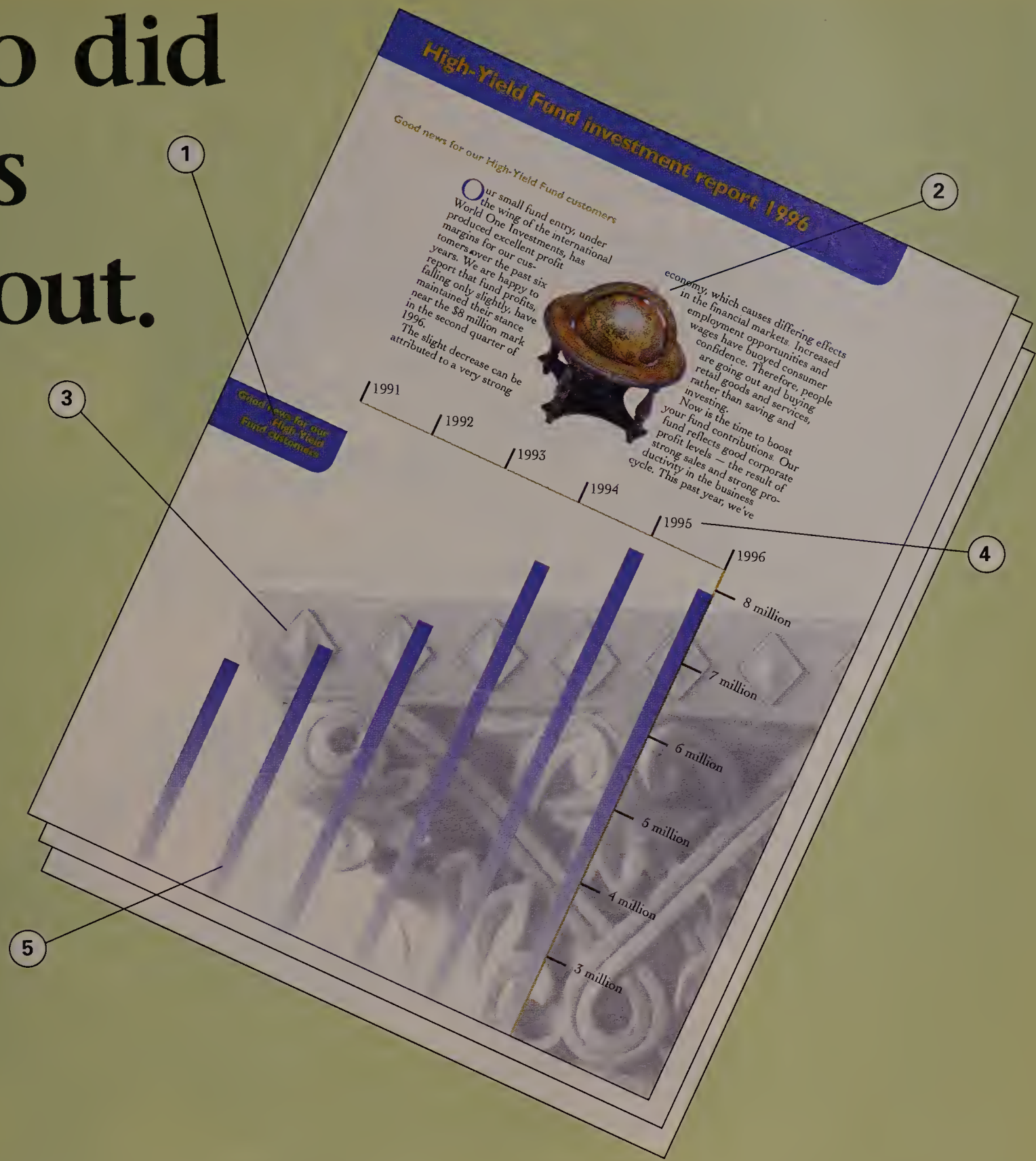

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are willing to install firewalls that protect *internal* LANs—to make sure, for instance, that a malicious employee in engineering can't log on and alter a list of sales records.

Unfortunately, since a firewall relies primarily on passwords to determine who's authorized to enter, its ability to keep out intruders is only as good as the identification system used to log in to a network. And in most cases, the password requirements are far too simple. Given the option to choose their own password, most people pick easy-to-guess birth dates, names of children, or initials—and that stymies criminals about as effectively as a $5 padlock.

TEN INTERNET SITES TO MAKE COMPUTING SAFER

Secure Computing
http://www.sctc.com Technical and product information about firewalls.

Security Dynamics
http://www.securid.com Information about smart cards and other advanced security products.

RSA Data Security
http://www.rsa.com Encryption products and standards, job postings, and software downloads.

Computer Security Institute
http://www.gocsi.com Testimony, surveys, guidebooks, and other educational literature on computer security from an international information-security organization.

Eliashim
http://www.eliashim.com Smart card and antivirus products and downloads.

Symantec Anti-Virus Research Center
http://www.symantec.com/avcenter Information on recent viruses, including how to detect and thwart them.

Silicon Toad's Hacking Resources
http://www.netwalk.com/~silicon/episteme.html Resources, software, and a guide to Web pages related to hacking and computer security.

Trusted Information Systems
http://www.tis.com Details about firewall technology and products, background on Internet security scanners, and job opportunities in computer security.

Center for Democracy and Technology
http://www.crypto.com/safe The SAFE (Security and Freedom through Encryption) Forum, sponsored by the computer industry in order to raise awareness of encryption technology's importance and to discuss U.S. cryptography policy.

National Computer Security Association
http://www.ncsa.com Security alerts, the latest information on viruses, and computer security help lines and forums.

THE FIREWALLS OF JERICHO

BECAUSE THEY RELY ON passwords, "firewalls are a low hurdle," argues Noel Matchett, president of Information Security, a computer security consultancy in Silver Spring, Maryland. Boeing Corporation learned that the hard way recently when two college students used the Internet to hack through firewalls and into the defense contractor's computer networks. The hackers' weapon was a simple program that automatically ran through every permutation of passwords and finally arrived at one that unlocked the network. "Once inside they wanted to get a list of authorized Boeing passwords, which they were going to sell to others," says Craig Worstel, the Seattle-based company's manager of computer and communications security.

The hackers were caught when they used a Boeing password to hack into a Cray Research computer system in Eagan, Minnesota, one of the defense contractor's suppliers. Both were sentenced to five years probation and 250 hours of community service.

Making matters worse, many companies—even those that are security conscious—are unwittingly drilling holes in their own firewalls by expanding the use of Internet browsers that contain applet tools like Sun Microsystems' Java. Hackers exploit security flaws in these tools to latch onto a company's Web server, which is generally outside the firewall's shield. After attaching themselves to the server, hackers can back in to the company's network by slipping through the firewall as if they were internal users who had logged on to the Internet to communicate or do business with customers.

Earlier this year, computer scientists at Princeton University found a security hole in Java, which is used to build interactive Web pages for such venues as electronic shopping and home banking. They also discovered three separate flaws in Netscape's Navigator browser, which hackers could use to slide through easily.

Even at relatively secure companies, a "single, motivated person could use [these weaknesses] to attack the machines of a large organization," writes Edward Felten, an assistant professor of computer science, on Princeton's Web site. Sun and Netscape say that Felten and his students are exaggerating the importance of their findings. For one thing, the flaws were corrected within days; for another, the companies say (after the fact) that they purposely display their software code on the Internet and release trial versions of their products so that groups like Princeton's can find and report weak spots.

Still, the weaknesses in Java and Navigator are a hacker's delight, according to computer security experts. What's more, these and other Internet software developers aren't likely to place a premium on security any time soon, says Richard Power, security analyst at the Computer Security Institute: "The competition is at such a fever pitch now that the commercial pressure is to push products out quickly and inexpensively. And that's a disincentive to invest time and money getting security right."

ENCRYPTION: THE BEST-KEPT SECRET

ULTIMATELY, THE MOST complete solutions for computer security may have to come from those with the greatest economic interest in finding answers. While most companies develop a false sense of security by relying solely on simple passwords and firewalls—and sometimes get burned as a result—a small ▶

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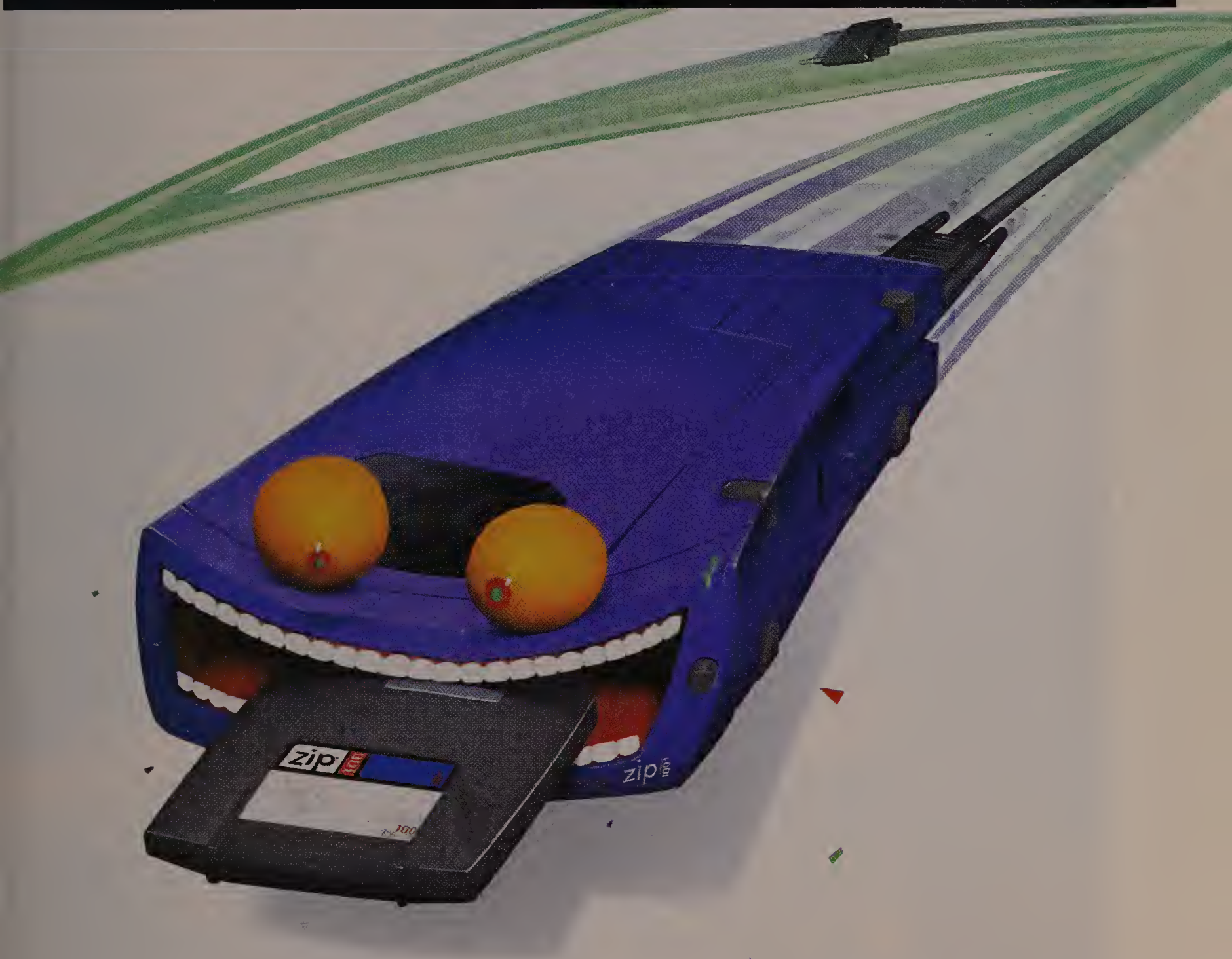

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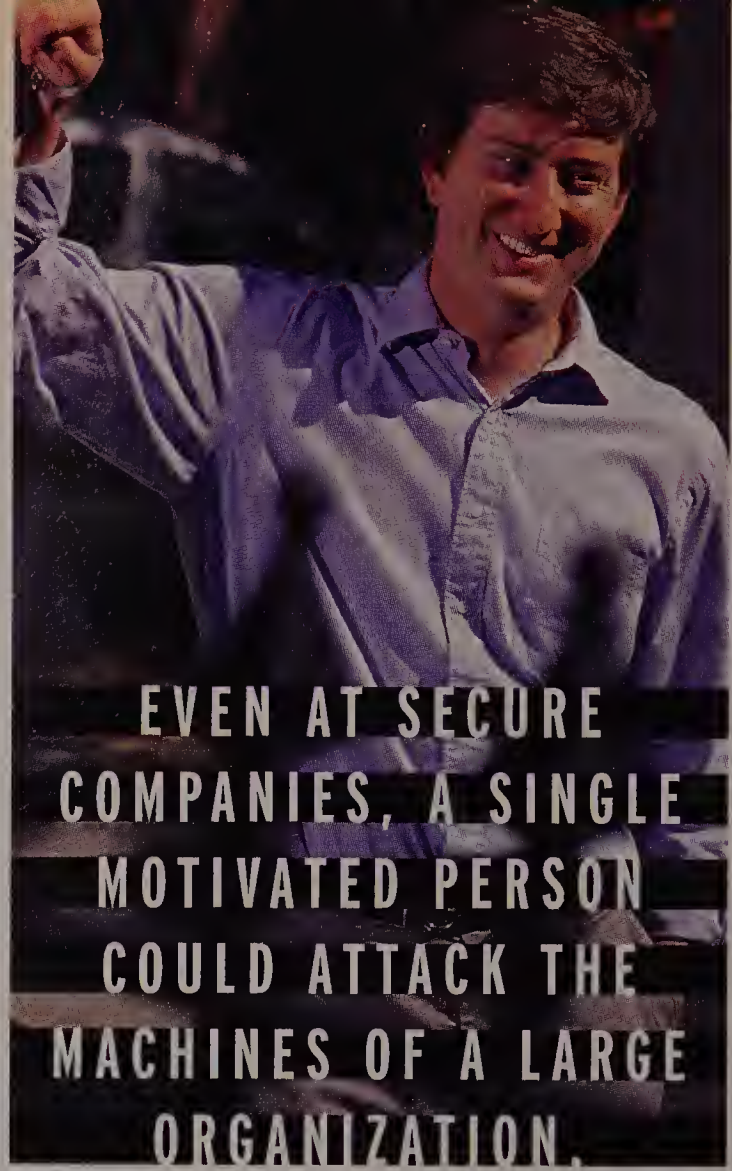
number of corporations with lots of money at stake are finally doing what security experts have said is the best fail-safe approach to combating hackers: encrypting corporate information. Whereas a password merely protects a file by locking it, encryption translates all data in the file into a secret code.

"If encryption were universally used, it wouldn't matter how secure firewalls, browsers, or Java were," says Information Security's Matchett. "Nobody would be able to *read* what they stole."

That's important to credit giants like MasterCard International and Visa International, companies that think an online shopping and banking gold mine is waiting for them on the Internet. But first these firms must come up with a security plan that puts customers at ease by protecting their credit card numbers and other personal information from hackers. "The goal is to make cyberspace bank-card transactions as safe as in retail stores," says Steve Mott, MasterCard senior vice president for electronic commerce.

After fighting much of last year over rival approaches, MasterCard and Visa recently released standards to safeguard credit card activities on the Internet. Joining forces with them are American Express, IBM, Microsoft, and Netscape Communications, among others. This joint effort, known as Secure Electronic Transactions, resulted in an encryption standard that encodes all credit card numbers and other personal information in such a way that only the user's and the merchant's banks can read it. Retailers themselves—essentially the intermediaries—can't unscramble the information, ensuring that hackers are unable to break through a firewall and read the data as it travels across the network.

SET is based on the highly touted encryption scheme known as public-private key that was developed primarily by RSA Data Security of Redwood City, California. The transaction data is sent in scrambled form from one bank to another, along with a secret key. The receiving bank's system can decipher the secret key, which changes with each transaction, then use it to unlock the encryption scheme and read the rest of the information sent. There is no reason why the same techniques used for encrypting monetary transactions can't be used for all types of data. Companies can easily encrypt data on their local servers and provide decrypting keys to qualified employees.



EDWARD FELTEN, PRINCETON UNIVERSITY

INSIDE JOBS

ENCRYPTION MAY address many computer security concerns, but it can't eliminate weaknesses in human nature. Unfortunately, dishonest employees probably still pose the biggest threat to safeguarding company secrets. While electronic attacks from outsiders are increasing more rapidly than any other kind, fully half of data break-ins are from insiders, typically by the most trusted staffers.

"In information crimes, it's not usually the janitor who's the culprit," says Ray Jarvis, president of Jarvis International Intelligence, a training academy and security consulting company in Tulsa. "It's more likely to be an angry manager who's already looking ahead to another job." In other words, the offender is probably someone who's authorized to have the key that unscrambles the encryption code.

Take William Gaede, for example—a disgruntled Intel supervisor who a couple of years ago was intent on stealing the blueprints for the Pentium chip and selling them to the competition. Gaede's name was on a list of those allowed to read the Pentium specifications, but he figured he'd get caught if he printed out the lengthy files at the company's offices in Santa Clara, ▶

SMALL BUSINESS DEFENSES

SMALL BUSINESSES often can't afford full-scale computer security plans, but they can't afford not to take hackers seriously, either. Here are some basic security tips that will help you set up at least minimal protection.

- Implement a rigorous password protection program for authorizing network log-ins: Require complex, not simple passwords; make people change their passwords regularly; and shut out anyone that types in an unauthorized password three times in a row.
- Install a comprehensive data security package; like all-in-one stereo systems, these are usually less expensive than individual components. The packages usually include simple encryption schemes (often not public-private key) for encoding information on hard disks and any data that's sent online, a virus protection utility, and an audit trail that logs all network activities whether they're done on connected PCs or local area networks.
- Select a small group of computer-savvy employees to act as network administrators. This is especially important for small businesses that rely on the Internet for advertising their wares, for e-mail, or for sharing data with clients. And since passwords alone authorize access to network administrator functions, these users should be rigorous about changing their passwords every few days.

PHOTOGRAPH: JIM FLANIGAN

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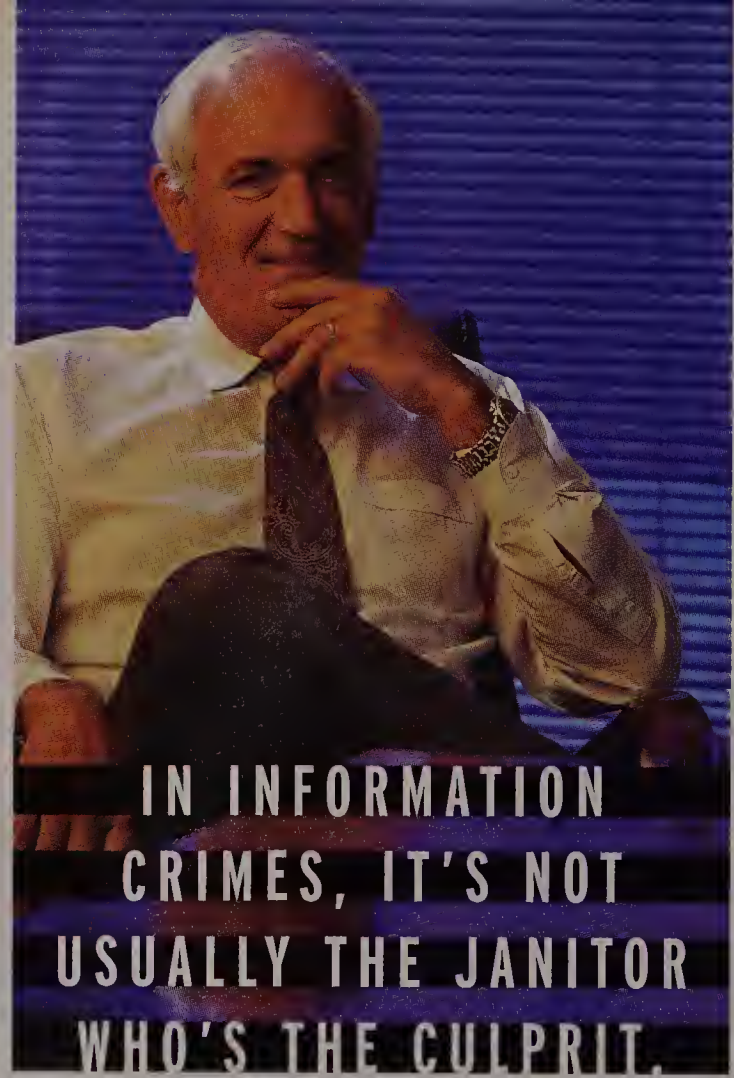
California. So he decided to steal the plans from home. Intel's security system allows read-only access of critical files at remote sites, but not downloading or printing. Gaede skirted that obstacle by videotaping the file from his home computer, screen by screen. He then left the country with the tapes and was arrested when he tried to sell them to undercover federal agents. This year, Gaede pleaded guilty to transportation of stolen property and mail fraud.

That kind of crime is difficult to stop, but few are so complex. More commonly, internal computer mischief includes employees bringing in viruses and stealing databases from the workplace. Stopping these activities requires something most companies are unwilling to pay for: a security SWAT team whose efforts are focused solely on monitoring breaches in computer systems.



RAY JARVIS, JARVIS INTERNATIONAL INTELLIGENCE

Most of the time corporations simply dump the job of maintaining secure systems onto the computer support group—nearly everywhere an overworked and understaffed department. Most of these staffers' time is so taken up with installing new computer equipment and fixing broken machines that tracking down viruses and going after hackers aren't top priorities. In fact, it's because computer support technicians tend to be weeks or even months behind in their day-to-day duties that frustrated employees are able to plug in unauthorized modems with no links to the firewall and install software themselves—causing even more fissures in the company's security system.

SEND IN THE TROOPS

DETROIT EDISON decided a couple of years ago that the old security model wasn't working, especially when the utility's computers were being hit by viruses almost monthly. So the company's chief of security created an emergency response team of a dozen computer administrators to tackle the problem.

Detroit Edison's strategy has paid off in a big way. For instance, on one late Friday night in August 1995, an employee found that a virus was destroying his Microsoft Word documents. He paged the security response team. Before long, members of the group had consulted with Microsoft and antivirus software makers to produce a quick fix. They inoculated PCs, LANs, and workstations—some 5300 computers—against the virus, and by Tuesday morning the problem was solved. "It would have been a disaster if it had spread throughout the organization," says Tom Peltier, who heads the Detroit Edison Virus Response Team.

A high-impact security unit like Detroit Edison's can head off problems before they become disasters, experts say. Even more important, each time a new application or system is proposed, the team can identify security risks and figure out ways to guard against them. They can also make sure that a working audit system is in place—one that consistently logs all attempts to gain access to the company's computers, prints a chronology of all network activity by users, and flags unusual activity.

While many corporations have an auditing system in place, such systems are often ignored. "I can't tell you how many times after an incident that we've talked to a company that thought it had virus and hacker protections, only to find out that the auditing function was either turned off or never installed in the first place," says Jay Douglas, a member of the technical staff at the Software Engineering Institute's Computer Emergency Response Team at Carnegie-Mellon University in Pittsburgh. For $20,000 a year, the CERT Affiliates Program offers seminars and technical advice for preventing computer break-ins and virus attacks and dealing with them if they occur.

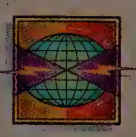
Although computer security is still clearly a low priority at many companies, it may not stay that way for much longer, thanks in part to how seriously the federal government now takes the issue. The FBI, the CIA, and the National Security Agency all have small units devoted to fighting computer security crimes. And after Senate hearings on the issue, the Justice Department proposed setting up a full-time task force to study the vulnerability of the nation's information infrastructure, creating a rapid-response intelligence group for computer crimes and requiring all firms to report break-ins to the FBI.

Despite the fact that it takes some hand-holding to force corporate America to pay attention to computer security, experts say the price is right, no matter what the cost. With more and more companies planning to hook up to the Internet and set up corporate networks called intranets, anything less than a full-fledged focus on the issue could be disastrous to the nation's economy.

"The Internet was once a rural community, and now it's becoming an urban environment," says Ronald L. Rivest, a professor of computer science at the Massachusetts Institute of Technology. "If you live out in farm country, you can leave your door unlocked. But if you live in downtown Manhattan, you'll probably want triple locks on your doors."

Jeffrey Rothfeder is a freelance writer and the author of Privacy for Sale *(Simon & Schuster, 1992, 800/983-5333).* ■

I N T E R N E T



FOR HOT LINKS to the security sites mentioned here as well as an opportunity to air your concerns on security, check out PC World Online (http://www.pcworld.com/security_talk).

PHOTOGRAPH: MICHAEL MAUER

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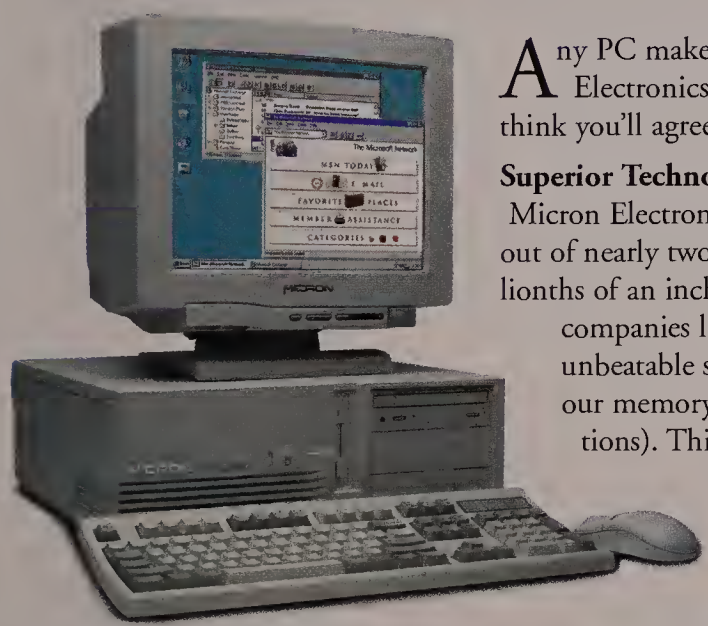

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Source: *PC World* Reliability & Service Monitor, May 20 - November 20, 1995

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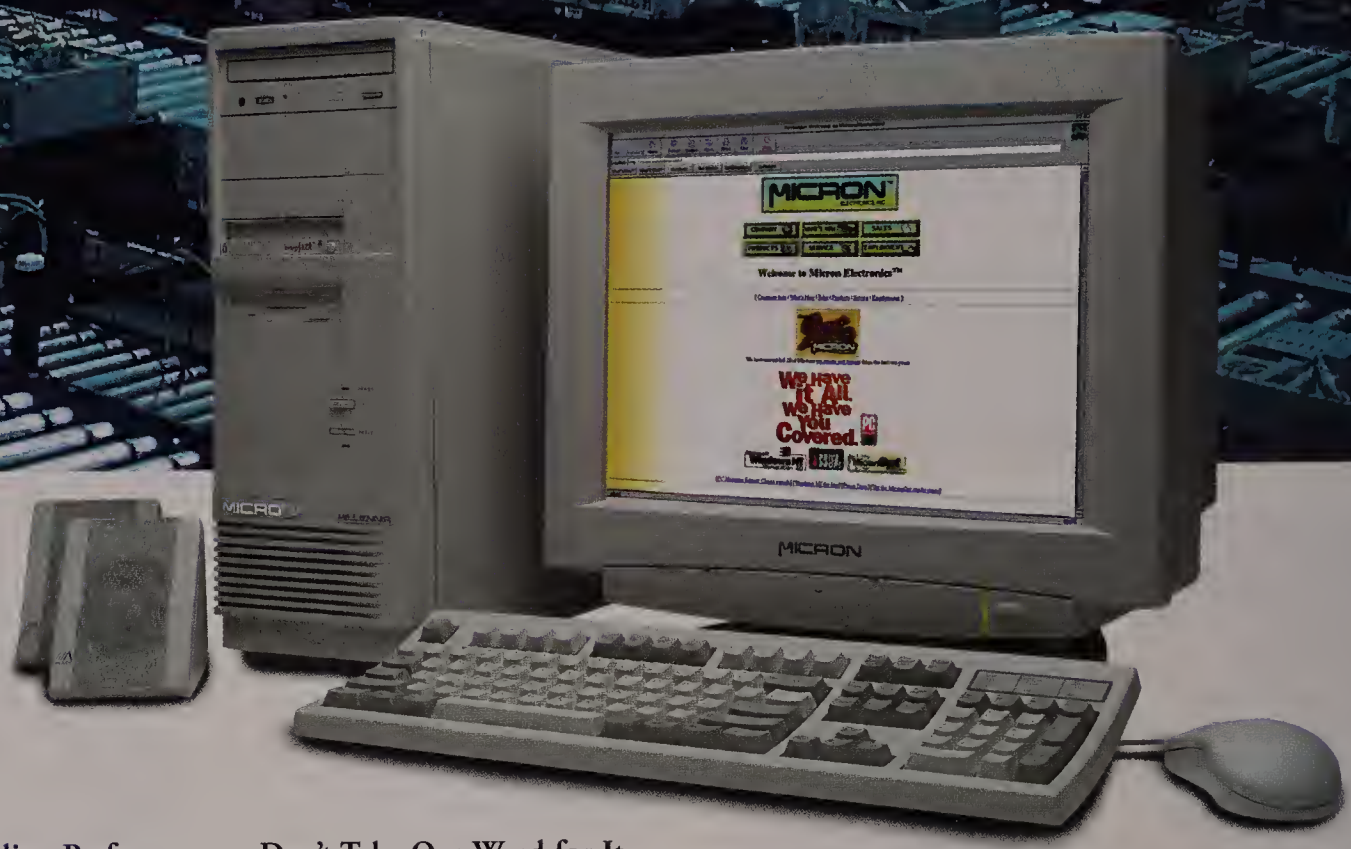

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- 2nd lithium-ion battery

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- Microsoft Windows NT Workstation 4.0 CD
- 5-year/3-year Micron Power warranty

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- Microsoft Works preinstalled

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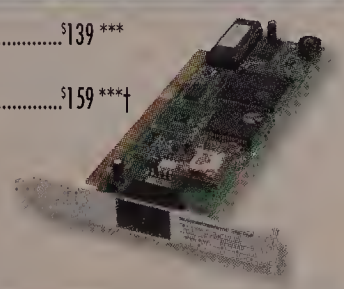

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- MicranExec™ desktop package: Matching black 17" monitor (15.8" display) with matching black mouse, mousepad and keyboard (can be used with or without MicranDock) $799
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** Requires SCSI Host Adapter
*** V.34 modem includes trial memberships to CompuServe®, Prodigy® and America Online®
† Requires sound card
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††† Upgrade from systems with standard 64-bit 2MB video card

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BY BRYAN HASTINGS AND KIRK STEERS

CHANCES ARE YOU EITHER WANT ACCESS to the Internet, or you want faster access to the Internet. For most of us, this means getting a new modem. Internal modems that fit inside PCs are popular choices. They're inexpensive, costing $20 to $50 less than their external counterparts, and they don't add to desktop clutter.

This roundup debuts our internal ISA card modem Top 10 (see chart on page 273). We evaluated 14 of the most popular V.34 internal modems and found out which were the fastest, which were the easiest to install, and which offer the best value. This roundup also reaffirmed the consumer's cardinal rule: Caveat emptor. A 33.6-kbps unit doesn't guarantee the fastest speeds, nor does the "Plug and Play" moniker guarantee painless installations. In fact, our tests revealed that most current Plug and Play PCs often won't let you install these modems in a truly Plug and Play fashion.

We looked at five aspects of these modems to come up with our overall rating: price, performance, features, ease of use, and support policies. None of the modems we looked at excelled in all areas, but our top products are the least deficient. Our two Best Buys are Motorola's LifeStyle 28.8 and Cardinal's MVP288IS, the former because of top performance and great ease of use; the latter for its wealth of features. ▶

ILLUSTRATIONS BY DAVID COWLES & PHOTOGRAPHS BY BEVERLEY HARPER

28.8kbps
V.34

The fastest modem (the Motorola LifeStyle) sends a megabyte of data in 2 minutes and 32 seconds; the slowest modem (the Practical Peripherals ProClass PC288HC V.34, which didn't make the Top 10) takes 45 seconds longer to send the same amount of data. This performance gap isn't a big concern if you stick mostly to e-mail messages. But the more large file attachments you send, and the more you browse the World Wide Web and download large files, the more performance matters.

PLUG AND PLAY: DON'T COUNT ON IT

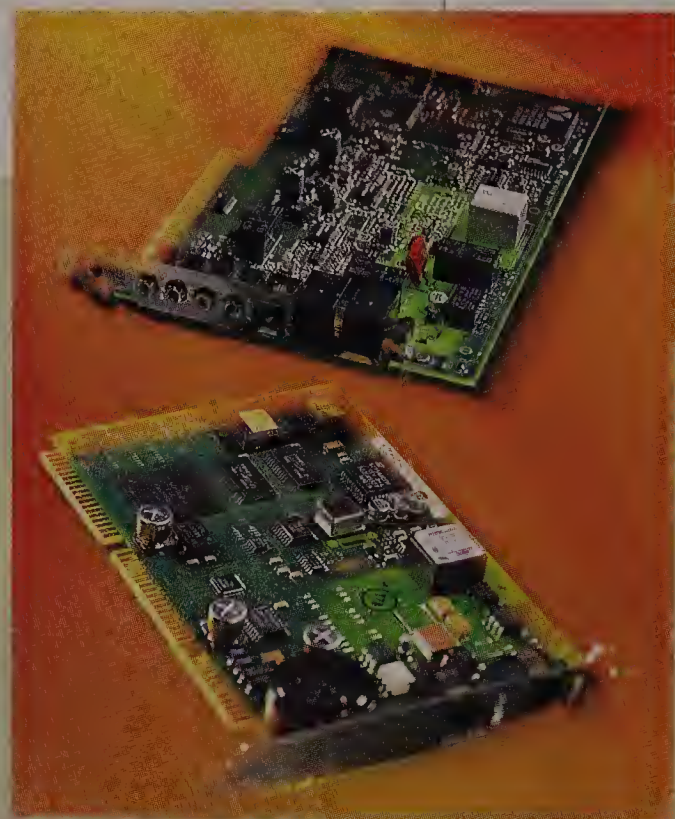
INTERNAL MODEMS HAVE BEEN NOTORIOUSLY difficult to get running. You have to take the case off your PC, plug the card into a free slot, and assign it its own resources, namely an IRQ and a COM port. The biggest problem has been figuring out what settings to assign, because many other devices in the computer draw from the same, often limited, pool of resources. Because they typically have four to five more IRQs at their disposal, 16-bit ISA modems have the edge over their 8-bit counterparts.

Plug and Play technology was supposed to solve the problem—just take the cover off your PC, stick in the card, and let the PC take care of the rest. But we discovered that even with the recommended three pieces of the Plug and Play puzzle in place—Windows 95, a Plug and Play modem, and a system equipped with a Plug and Play BIOS—the process can still be frustrating. Only three of the seven Plug and Play modems we tested, the Motorola and the two Hayes products, provided a truly frustration-free installation most of the time. All three are 16-bit cards.

To test Plug and Play, we used five computers selected to provide the most representative range of PCs and BIOSes. The first system, a Gateway DX2-66V desktop, is four years old and contains a non–Plug and Play (aka *legacy*) BIOS. Ironically, this was one of only two PCs in which Plug and Play actually worked for all seven Plug and Play modems. The other four PCs we used have Plug and Play BIOSes, but of those, only the Quantex QP6-SM2, with its American Megatrends v1.00 BIOS, performed ideally. On our Amax Pentium Power Station tower, with its Award v4.50 BIOS, only three of the seven Plug and Play modems installed without any prodding from us.

Best *Buys*

THE $175 MOTOROLA LifeStyle 28.8 (bottom) is the best all-around modem. It's the fastest unit on the chart, is exceptionally well made, and is one of the easiest to install and use. The $189 Cardinal MVP288IS (top) is our other Best Buy. It's packed with more features, including voice mail and speakerphone, than any other modem in the group, and it's easy to set up and use.



Is Plug and Play *Your Best Bet?*

INCREASINGLY, YES—but our tests show that like a nagging cold, Plug and Play incompatibilities just haven't gone away. So if you dread the idea of adjusting jumpers and switches, do your homework before deciding on a Plug and Play modem.

1. Is your PC packed to the hilt with multimedia, a network card, an internal tape backup drive, the works? If so, that means resources are scarce. So if you opt for a Plug and Play card, make sure it's 16-bit.
2. Identify your PC's BIOS. Most computers will display the name, date, and version of the BIOS immediately after powering up. Hitting <Pause> will often freeze the screen so you can jot down this information. If you've upgraded to Windows 95 from DOS or Windows 3.1, you can also get BIOS information from the MSD.EXE utility program.
3. Once you know which BIOS you have, call your PC company's tech support. Ask them to search their knowledge base for known

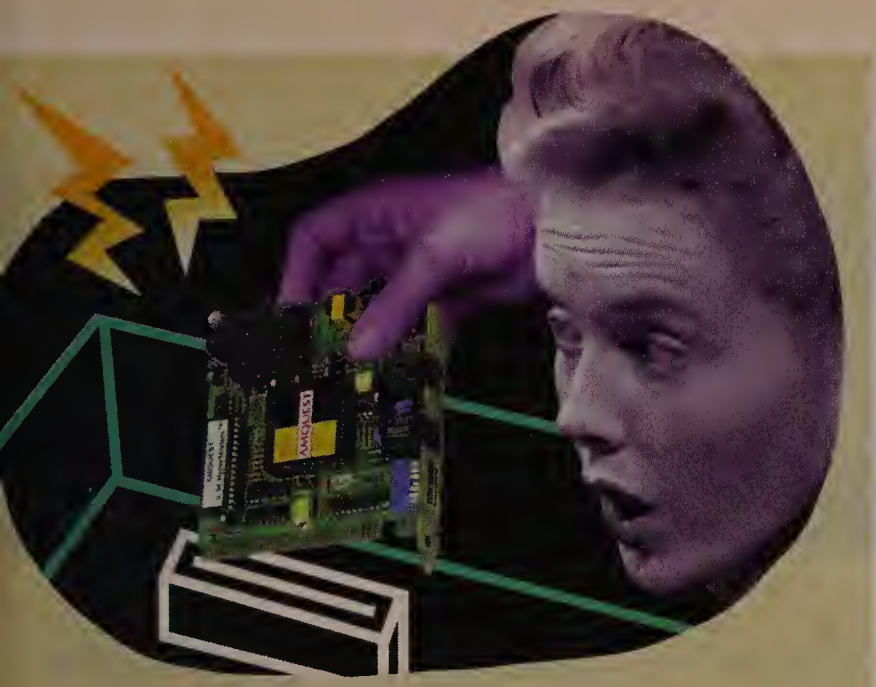
We had the worst experiences with the two systems that have Phoenix BIOSes. None of the modems were automatically detected and set up by the NEC PowerMate V100 (Phoenix v4.05), but we were able to get all of them to work by manually configuring them in Windows. (The Amax, NEC, and Quantex desktop and tower computers are still being sold.)

The two-year-old Micron P90 Millennia desktop (Phoenix v4.04) was a Plug and Play disaster. We were able to install only the Cardinal modem, and that was after a lot of wrangling with COM ports and IRQs. The other cards either disabled the PC's mouse or appeared to install but still remained unrecognized. If you have a Micron P90 Millennia, you might be better off going with a non–Plug and Play modem. See "Is Plug and Play Your Best Bet?" for advice on how to make your Plug and Play experience as painless as possible.

A word about legacy modems: The most common internal modem settings are COM2 and IRQ3, and all legacy modems we tested came preset to this same pair. Once we configured the installation test-bed PCs so that COM2 and IRQ3 were free, all legacy installations went smoothly.

PERFORMANCE: SPECS VERSUS REALITY

THE BEST MEASURE OF MODEM PERFORMANCE is *throughput*, the time it takes to transfer a given amount of data. Surprisingly, the fastest 33.6-kbps modem we tested was still slower than six of the 28.8-kbps modems on the chart. There are at least two likely explanations: 33.6-kbps modems are relatively new, so kinks still need to be worked out; and the phone network itself tends to prevent analog modems from connecting at higher than 26.4 kbps.



Plug and Play incompatibilities with the modem you're interested in. Another useful source is Microsoft's knowledge base (http://www.microsoft.com/support). If there are incompatibilities, find out if your PC has an upgradable flash BIOS. There may be a simple software upgrade fix.

To test throughput, we install an identical pair of modems in two Compaq Deskpro 486DX2-66 desktops, and connect them through a simulated public telephone network (see the Test Report). We run two tests that focus on both the modem's ability to work well over a variety of line conditions, and how well it sends different types of files. For the first test, we send a 328K text file over 55 different line conditions that represent 95 percent of the connections made in the United States. For the second test, we send four of the most common file types—graphics, text, program, and compressed—both individually and in a group over a single commonly encountered line condition. We then average the results of the two tests to derive the modem's overall performance time, shown as the "Average transfer time per MB" in the Test Report and in the Top 10 chart appearing on page 273. All results in the Test Report show the time it takes to send a megabyte of data.

ALSO-RANS

OF THE MODEMS TESTED, FOUR MISSED the Top 10 chart. Amquest's Hypermodem is reasonably priced and exceptionally fast, but skimpy features and poor support keep it off the chart. Diamond's SupraExpress 288i Sp is rich in features, but it was sluggish in our speed tests. Also slow were Practical Peripherals' ProClass PC288HC V.34 and MultiTech's MT2834ZPX. We pulled the U.S. Robotics Sportster Winmodem from Top 10 contention because its performance depends heavily on the PC it's plugged into and we couldn't get a meaningful measurement from our current benchmark. See "The Sportster Winmodem Prefers Pentiums" for more details.

Bryan Hastings is a senior associate editor, Eric Hellweg an assistant editor, and Kirk Steers a contributing editor for PC World.

For more information about all products in this article, circle reader service no. 911.

❶ Motorola LifeStyle 28.8

PRO: Top performance, quality construction, very good documentation, easy installation, good service and support

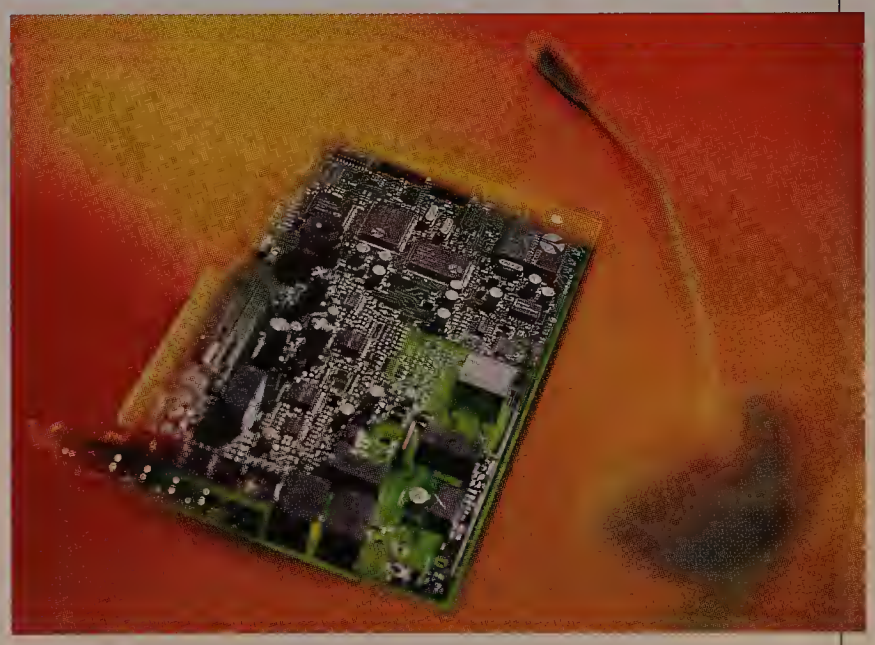
CON: Pricey

WHY SHOULD YOU PAY $175 for a modem at a time when the first V.34 modems are dipping below $100? The LifeStyle 28.8 is decidedly pricey. But you get blazing performance, terrific ease of use, and solid support. We've received nothing but positive feedback from Motorola modem owners.

We were impressed from the moment we opened the box, from the thorough reference manual, to the Quick Start guide complete with instructions for Windows 95 installations, to the clean, uncluttered circuitry on the modem card. Although you don't see "Plug and Play" printed anywhere, the LifeStyle sailed through the installation without our having to know a COM port from Portland, Maine. The LifeStyle also comes with QuickLink II.

Our benchmarks put the LifeStyle first in performance among the modems on the Top 10 chart. It did especially well on the phone line test.

The LifeStyle's feature set won't blow you away—you don't get voice mail or speakerphone capability, for example. But it's not totally bereft of extras. It supports the Distinctive Ring and Caller ID phone services. It's also one of the few modems that shuts off its phone jack when there's a file transfer in progress, a thoughtful design touch. Motorola backs its modem with a good support package, including a five-year warranty and toll-free support.



CARDINAL'S MODEM IS ALL TALK and a good deal of action. It lets your PC be a telephone answering machine, and you can use the supplied mike, along with your PC's speakers, as a speakerphone.

Motorola, 800/566-3266, http://www.mot.com/modems

READER SERVICE NO. 720

❷ Cardinal MVP288IS

PRO: Replete with features, lifetime warranty

CON: Long card takes up lots of internal space, few IRQs to choose from

IF ALL YOU NEED IS A BASIC MODEM, you can find a good one for less money than the $189 MVP288IS. But if you're looking for all the bells and whistles, this is one of the best deals you can find. It has more features than any other ▶

A Desktop That's Actually Capable C

I'm no wimp. But it's pretty hot in here.

Talk about considerate. Beyon

having a thermal sensor that tells you i

it's too hot, the new Compaq Deskpr

will warn you if its hard drive's abou

to fail anywhere. It's all part of what w

call the next generation of Intelligen

Manageability. Among other things, i

intel inside
PENTIUM® PRO
PROCESSOR

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Features vary by model. Monitor not included. Thermal sensor available only on Deskpro 4000 and 6000. Some features available with Compaq Deskpro and independent software applications. Oth
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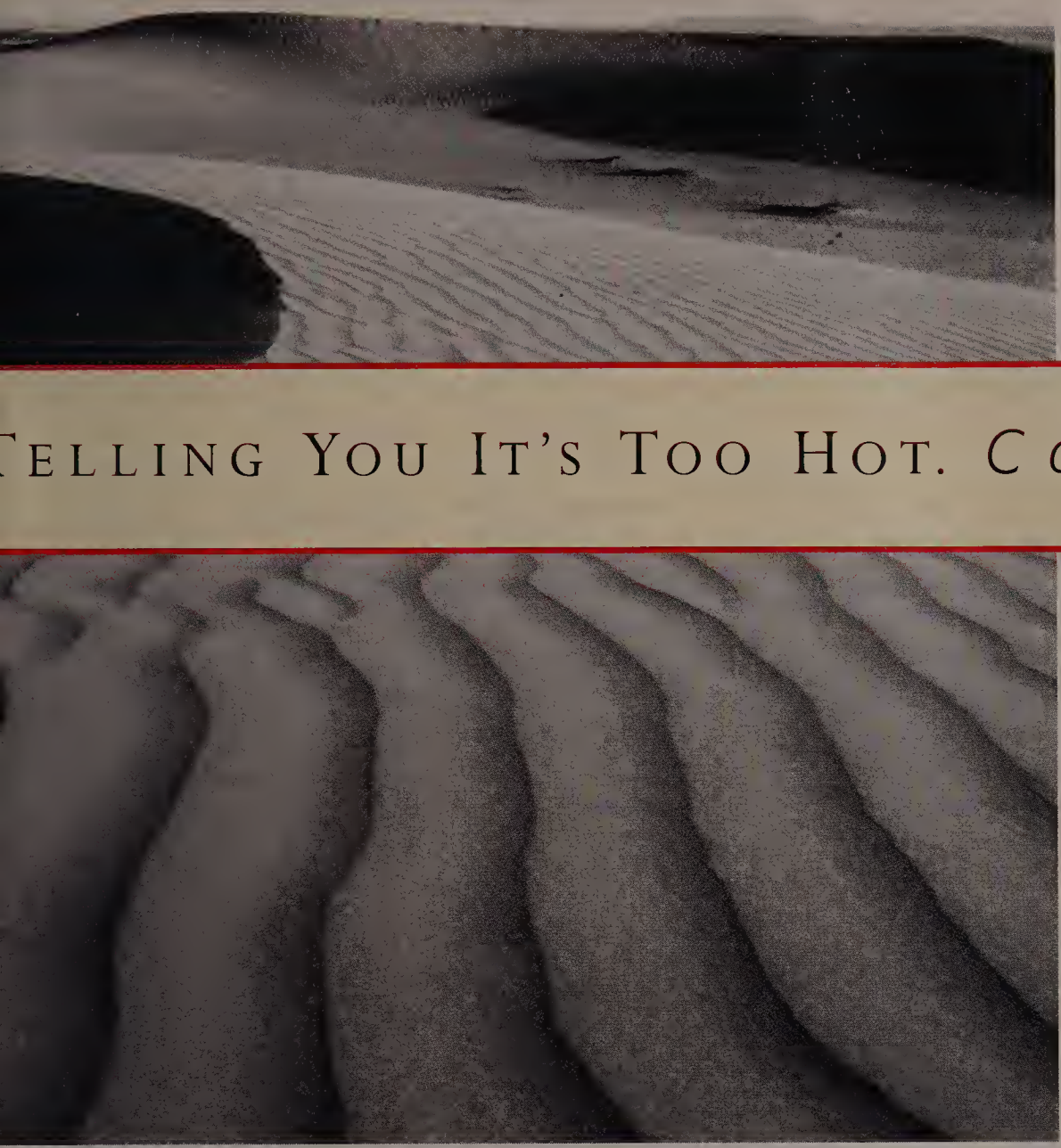

Telling You It's Too Hot. *Cool.*

allows you to take inventory of all your hardware and software from one location. In case of hard drive failure, it backs up your data on the network; and now, thanks to our new PD-CD drive backup, it also preserves your data locally. There's even a sensor in the hood that alerts the support desk if anyone's tampered with it.

Intelligent Manageability is still based on open industry standards that ensure compatibility and integration with any network. Our partnerships with Microsoft, Novell, Intel and others give IS managers a broader range of integrated solutions. And to minimize installation and your configuration time, we provide an upgradeable integrated NIC and network-ready software which protects your investment and allows for growth. Ultimately what you get with Intelligent Manageability is lowered cost of ownership. Add to that a three-year warranty, plus dedicated toll-free technical support that's open for business seven days a week, 24 hours a day. Control. It's what makes the new Compaq Deskpro so hot. In a cool kind of way. For more information, visit us at www.compaq.com or call 1-800-392-8883.

COMPAQ

Circle 35 on reader service card

Has It Changed Your Life Yet?

modem reviewed here, and that, coupled with decent performance and ease of use, scores it a Best Buy.

One of the highlights is the unit's voice capabilities. The MVP288IS comes with full-duplex speakerphone and a microphone, and you can set it up so that your PC's speakers automatically shut off other audio, such as music coming from a CD playing in your PC, when you begin using the speakerphone. When you're not in the office, you can set voice mail to dial another number, such as your beeper, and alert you to new messages. If you need to transfer data over cellular channels, you'll be glad to hear that the MVP288IS supports MNP-10EC, the most common cellular protocol. The modem can also take advantage of Distinctive Ring and Caller ID if you subscribe to these phone services. Voice mail is managed by FaxWorks 3.0, one of the better fax/data packages.

The MVP288IS is unique among the modems we tested in that it comes with FlashROM, which means you can add features and performance enhancements through software if you want to upgrade the unit. By the time you read this, Cardinal should have a free software upgrade to 33.6 kbps. The 8-bit MVP288IS is a Plug and Play modem, and installation was a breeze. Cardinal also made sure the documentation speaks to the masses. The modem comes with a lifetime warranty, but after one year you have to pay $25 in shipping and handling charges for each repair. *Cardinal, 800/775-0899, http://www.cardtech.com*

READER SERVICE NO. 721

❸ U.S. Robotics Sportster Faxmodem

PRO: Plug and Play and manual installation, good software

CON: Slow for a 33.6-kbps modem, can't use IRQs beyond IRQ7

THE SPORTSTER FAXMODEM is a decent value for $159. What we think is way cool: You can install this 8-bit card either as a Plug and Play or as a legacy board. The modem comes preset for Plug and Play. But if your PC fails to boot, you can reset the jumpers on the board for whatever COM/IRQ settings work.

The Sportster installed cleanly in its Plug and Play persona on two of the five installation test beds. When we had to resort to a manual installation, we found the documentation very helpful.

There's still room for improvement. The Sportster is one of the few modems we tested that support 33.6 kbps, so the least we expected was loads of connections at 26.4 kbps, the highest rate at which our performance test PC allows consistent connects. No such luck. The Sportster Faxmodem ended up in the middle of the Top 10 pack. The Sportster is backed by a five-year warranty and 10 hours of tech support per weekday. But you have to pay for the call. We had to spend several minutes navigating voice menus before being put on hold for an additional 15 minutes before we finally spoke to a tech support person. Arghh!

The software bundle is excellent. The included fax/data package, QuickLink II, equals FaxWorks 3.0 in features and ease of use. And the Connections CD-ROM contains a trial version of Quicken. *U.S. Robotics, 800/342-5877, http://www.usr.com*

READER SERVICE NO. 722

TEST REPORT

Motorola's LifeStyle Pulls Well Ahead of the Pack

U.S. Robotics' Sportster Faxmodem is the only 33.6-kbps modem on the Top 10 chart.

Modems are arranged in order of overall performance from best to worst, based on the normalized, weighted scores from two tests.

phone line test file type test

HOW WE TEST We install an identical pair of modems in two Compaq Deskpro 486DX2-66s, each containing 12MB of RAM. We connect the modems through a TAS simulated public phone network that uses Hayes 230-kbps ESP serial cards. We measure the transfer rate of the modems using the phone line test and the file type test, as outlined in EIA/TIA TSB 37 and 38b. For the phone line test, we send a 328K text file over 55 different line conditions, which represent 95 percent of the line conditions in the United States. For the file type test, we send a 983K graphics file, a 328K text file, a 197K program file, a 131K compressed file, and a 524K mix of files of the previous four types all over the same line condition. We average the results of the two tests.

Click Click
<Esc> @10,20
Click Click
Click <Esc>
#@!? Redraw
Click <Tab>
<Tab> 14.3
Click <Esc>
Click + Drag
Crash #@!?

- Other 2D Drawing Tools

Click
Click
Click
Click
Click

- Imagineer™ Technical

Draw your own conclusion.

Imagineer's easy-to-use drawing tools and intuitive on-screen feedback render other drawing programs obsolete. Intergraph Imagineer™ Technical lets you create precision 2D drawings with half the mouse-clicks, keystrokes and command changes of most drawing software.

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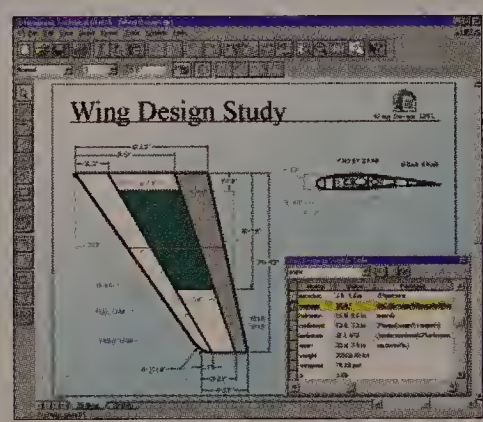

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Circle 106 on reader service card

Designed for Microsoft® Windows 95

intel inside pentium® PROCESSOR

Best Pentium processor-based PC at entry-level price.

- Intel 75 or 100 MHz Pentium processor
- 8–16MB RAM, expandable to 128MB
- EDO RAM
- Optional 256KB cache
- 640MB** high-performance Enhanced-IDE hard drive
- PCI integrated graphics accelerator and 1MB DRAM standard, upgradable to 2MB
- Flash BIOS for easy upgrade
- Designed for Windows® 95
- Preloaded HP DMI Desktop Management Interface
- Free three-year limited warranty for parts and labor[1]

from $1,262*

HP Vectra VE

Best managed PC.

- Intel 75, 100, 120, 133, 150 or 166 MHz Pentium processor
- LAN Remote Power
- PCI integrated 32-bit 10Base-T Ethernet interface
- Network certified and preconfigured for Microsoft® and Novell clients
- Preloaded HP DMI Desktop Management Interface
- Vectra Op-Center
- Norton Smart Disk Doctor
- Parallel transfer driver preinstalled for faster LAN packet processing
- Advanced security meeting C2 level
- 64-bit graphics accelerator on PCI bus
- 1MB video RAM, expandable to 2MB
- 8 or 16MB EDO RAM, expandable to 128MB
- 840 or 1280MB Enhanced-IDE hard drive
- 4 mass storage shelves (3 front accessible), 4 expansion slots
- Two 32-bit PCI slots
- Flash BIOS for easy upgrade
- Designed for Windows 95
- Free three-year limited warranty for parts and labor[1]

from $1,513*

HP Vectra XM

Leading Pentium processor/PCI performance at an affordable price.

- Intel 100, 120, 133, 150 or 166 MHz Pentium processor
- Desktop and minitower packages
- 256KB burst synchronous cache
- 8–16MB RAM, expandable to 128MB
- EDO RAM
- PCI/ISA architecture
- 640MB** high-performance Enhanced-IDE hard drive
- PCI integrated graphics accelerator and 1MB DRAM standard, upgradable to 2MB or Matrox Millenium PCI graphics card with 3D acceleration and 2MB WRAM, upgradable to 8MB
- Flash BIOS for easy upgrade
- Full plug-and-play capability
- Designed for Windows 95
- Preloaded HP DMI Desktop Management Interface
- Free three-year limited warranty for parts and labor[1]

from $1,415*

HP Vectra VL

[1]In Canada, call 1-800-387-3867. *Average U.S. street price. Monitor not included. **Other capacities available. HP Vectra PCs come with MS-DOS® 6.2 and MS Windows for Workgroups 3.11; or Windows OS/2 or Windows NT included. [1]First year, on-site, 24-hour, next-day service. Second and third year, return to dealer. Microsoft, MS-DOS, Windows and Windows NT are U.S. registered trademarks Microsoft Corporation. Pentium and the Intel Inside logo are registered trademarks of Intel Corporation. OS/2 is a registered trademark of the International Business Machines Corporation.
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PC MAGAZINE EDITORS' CHOICE

February 20, 1996
HP Vectra XU 6/150

The ultimate PC.

- Intel Pentium Pro 150, 180 or 200 MHz processor with 256KB integrated cache
- Supports dual processing with secondary Pentium Pro socket
- 128-bit high-performance memory architecture
- 16–32MB ECC DIMM memory standard, expandable to 256MB with 8 DIMM memory expansion slots
- PCI integrated Ultra SCSI Fast 20 interface with 20MB/s throughput
- 1,000MB** SCSI-2 high-performance hard drive
- PCI Matrox Millenium graphics card with 3D acceleration and 2MB WRAM, upgradable to 4MB or 8MB
- 7 mass storage shelves (5 front accessible)
- 6 expansion slots: 3 PCI, 1 PCI/ISA combo and 2 ISA
- 10Base-T/100VG AnyLAN selectable PCI NIC with up to 100 Mb/s throughput
- Integrated 16-bit audio and 4X CD-ROM
- Microsoft Windows NT® 3.51
- Free three-year limited warranty for parts and labor[1]

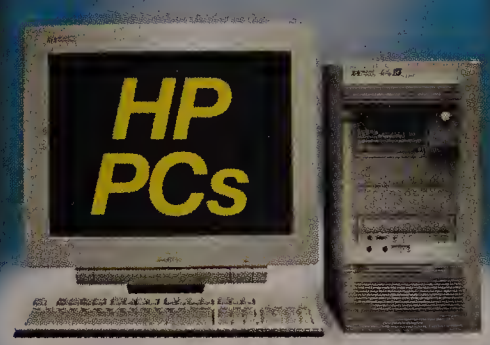
from $3,939*

HP Vectra XU

Exceptional performance and expandability at an affordable price.

- Intel Pentium Pro 150 MHz processor with 256KB integrated cache
- 128-bit high-performance memory architecture
- 16MB DIMM memory standard, expandable to 256MB with 8 DIMM memory expansion sockets
- 1,000MB** Enhanced-IDE hard drive
- PCI Matrox Millenium graphics card with 3D acceleration and 2MB WRAM, upgradable to 4MB or 8MB
- 7 mass storage shelves (5 front accessible)
- 6 expansion slots: 3 PCI, 1 PCI/ISA combo and 2 ISA
- Integrated 16-bit audio and 4X CD-ROM
- Microsoft Windows NT 3.51 or IBM OS/2® Warp
- Free three-year limited warranty for parts and labor[1]

from $2,615*



HP Vectra VT

Helpful hint:

Rip out and pin up next to Compaq and IBM ads.

A little comparison shopping will quickly show you that HP puts the best prices on the most impressive PCs. One standout is the network-ready Vectra XM. It's configured for the most demanding networks with LAN Remote Power, Super-fast LAN install and HP Vectra Op-Center for more effective remote management. Every Vectra will outshine the competition when it comes to features and price. From the Pentium® processor-based PCs to the dual Pentium Pro processor-based HP Vectra XU PC. For more information or the name of your nearest HP reseller, call 1-800-322-HPPC, Ext. 1704.[1] Or visit us at http://www.hp.com/go/vectra.

HEWLETT® PACKARD

❹ Zoom V.34I FaxModem Model 275

PRO: Terrific price, weekend support, long support hours

CON: Installation is not for those with short fuses

THE ZOOM V.34I'S GREAT ATTRACTION can be summed up in one number: $109. If you don't need anything fancy and are handy at installing devices in PCs, it can save you a lot of money.

As with the company's V.34 PC Card that appeared in the Top 10 chart of PC Card modems earlier this year, installation is this 8-bit card's weak point. It's not Plug and Play, which forced us to fiddle with jumpers and switches, and we were left in the cold as to what driver to use. The documentation told us to pick a Zoom modem from the list in Windows 95 but failed to tell us which model to choose. It's a small stumbling block, but one that will send many a neophyte to tech support. Were it not for this Achilles' heel, the V.34I might have earned a Best Buy. Fortunately, support is available more than 14 hours per weekday and on the weekend as well.

Once we got the modem installed, it worked fine. Performance was a little under par. Features are basic, although you do get support for Distinctive Ring. The V.34I also comes with MNP-10EC, the most common protocol for sending files over cellular connections. The bundled software consists of WinFax Lite and Comit for Windows. Both are quite functional and relatively easy to learn, although you probably wouldn't get up to speed with them as quickly as with FaxWorks 3.0 or QuickLink II. *Zoom, 800/631-3116, http://www.zoomtel.com*

READER SERVICE NO. 723

❺ Hayes Total Internet Solution

PRO: Easy to install, easy-to-read manual, toll-free tech support

CON: Sluggish performance, large card

"TOTAL" IS STRETCHING THINGS, as you'll find out below. But this is one of the best packages we've seen so far for getting on the Internet without a lot of fuss or bother.

This $163 package has its shortcomings. The modem, an entry-level Hayes Accura 288, provides only basic functions. But the good decidedly outweighs the bad. This Plug and Play modem gave us one of our most trouble-free installations. It's a 16-bit card, which means you have a wide selection of IRQs.

PLUG AND PLAY? MANUAL? U.S. Robotics' Sportster Faxmodem can swing either way by setting jumpers (see close-up). Given the ongoing problems with PnP, we'd like to see this flexibility in all ISA modems.

We weren't thrilled by the ample software bundle. The SmartCom Message Center LE fax/data package isn't nearly as easy to use as FaxWorks 3.0 or QuickLink II. And the InternetSuite 2.0 CD-ROM from Quarterdeck, a tool chest of Internet utilities, is outdated. The first thing we'd do with the supplied Mosaic browser is grab Microsoft's Internet Explorer or a preproduction version of the latest Netscape Navigator off the Net—these are far superior and free for the downloading. But SmartCom is a very capable package, if not exactly approachable, and the Quarterdeck disc includes some handy utilities, including one that lets you decide what your kids can see online.

Hayes backs its modem with good support policies. Tech sup-

INTERNAL MODEMS SCORECARD FEATURES

	MODEMS	Street price (8/15/96)	Ease of installation	Documentation	Software bundle	Maximum data/fax rate (kbps)	Plug and Play/ legacy	ISA card type/length (inches)	V.FC/ V.32ter
1	Motorola LifeStyle 28.8*	$175	outstanding	very good	very good	28.8/14.4	●/○	16-bit/6.5	○/○
2	Cardinal MVP288IS*	$189	very good	good	very good	28.8 [1]/14.4	●/○	8-bit/8.2	●/○
3	U.S. Robotics Sportster Faxmodem	$159	very good	good	outstanding	33.6/14.4	●/●	8-bit/5.3	●/○
4	Zoom V.34I FaxModem Model 275	$109	fair	good	good	28.8/14.4	○/●	8-bit/5.4	●/○
5	Hayes Total Internet Solution	$163	outstanding	good	good	28.8/14.4	●/○	16-bit/8	●/○
6	Hayes Total Gaming Solution	$259	outstanding	good	good	28.8/14.4	●/○	16-bit/8	●/○
7	E-Tech Bullet PC288MX	$152	fair	fair	good	28.8/14.4	○/●	8-bit/5.3	○/●
8	Microcom DeskPorte 28.8S	$143	good	very good	very good	28.8/14.4	○/●	8-bit/5	●/○
9	Boca Bocamodem V.34 28800bps	$179	good	very good	very good	28.8/14.4	○/●	8-bit/4.5	●/○
10	Boca V.34 Office Communicator	$199	very good	good	very good	28.8/14.4	●/○	16-bit/11.3	●/○

*Best Buy [1]Upgradable to 33.6 kbps. See Top 10 chart, page 273. ● Yes ○ No

port is available 10 hours per weekday, on Hayes's dime. Reader comments on Hayes have been positive. The company emerged last year from Chapter 11 bankruptcy, but we've gotten no indication that the quality of its support has suffered. *Hayes, 770/840-9200, http://www.hayes.com*

READER SERVICE NO. 724

❻ Hayes Total Gaming Solution

PRO: Voice mail, DSVD, VoiceView, painless installation, very good support

CON: Very expensive, long card

OVERALL, THE TOTAL GAMING SOLUTION is one of the most complete packages we've seen. The main thing keeping it from a Best Buy? At $259, it's the most expensive package here.

IS YOUR PC PACKED WITH PERIPHERALS? You're better off with a 16-bit modem, identified by its two rows of pins (see upper edge of card in front). 16-bit modems can use more of the PC's settings.

As the name suggests, the product is geared for gaming. If you'd like to tell your tail gunner to attack that incoming MiG-29 or maybe shower a little verbal abuse on the opponent who just incinerated you in Doom, the Total Gaming Solution lets you do just that. With Hayes's Accura 288 + Voice + DSVD modem, you can speak and send data at the same time using DSVD. You can conduct your digital warfare using the included microphone and speakerphone. Hayes also throws in NASCAR Racing, a fast-paced simulation game.

This package is also fine for business use and Net surfing. It's hard to cozy up to the included SmartCom Message Center LE fax/data software, but it works with the modem's voice-mail feature, has pager notification, and lets you set up a simple fax-on-demand system. You can browse an online mall, then use VoiceView to speak to a salesperson by just clicking a button. Hayes also tosses in Quarterdeck's InternetSuite 2.0.

Even the terminally technophobic should have no trouble getting this 16-bit Plug and Play modem up and running. Its performance was average for a Top 10 modem, taking 2 minutes and 47 seconds to send a megabyte of data. The product is backed by Hayes's fine support package, which includes toll-free support and a five-year warranty. *Hayes, 770/840-9200, http://www.hayes.com*

READER SERVICE NO. 725

❼ E-Tech Bullet PC288MX

PRO: Fast, toll-free support

CON: Few features, needs better documentation, unclear installation

E-TECH'S BULLET IS A ONE-TRICK PONY that offers speed and little else. This $152 modem is affordable, but it's best for users who don't need extras and who have a talent for twiddling jumper and switch settings on their PCs.

The Bullet whizzed through our performance tests, but it's a plain legacy card and the manual is unhelpful. So you may have to spend some time flailing around with COM and IRQ settings. Novices may well end up calling technical support to complete the installation. Fortunately, E-Tech offers a toll-free tech support number. *E-Tech, 800/328-5538, http://www.bulletel.com* ▶

READER SERVICE NO. 726

MODEMS

MNP-10EC	Fax Class 1/ 2 (protocol)/ 2.0 (standard)	Fax/data software	Voice mail/ speakerphone	VoiceView/ DSVD	FlashROM upgrade	Distinctive Ring	Caller ID	SUPPORT: Warranty (years)	SUPPORT: Weekday support (hours)/ toll-free	SUPPORT: Weekend support
○	●/○/○	QuickLink II	○/○	○/○	○	●	●	5	9/●	○
●	●/●/○	FaxWorks 3.0	●/●	●/○	●	●	●	lifetime	12/○	○
○	●/○/●	QuickLink II	○/○	○/○	○	○	○	5	10/○	○
●	●/●/○	Comit for Windows, WinFax Lite	○/○	○/○	○	●	○	7	14.5/○	●
○	●/●/○	SmartCom Message Center LE	○/○	○/○	○	●	○	5	10/●	○
○	●/●/○	SmartCom Message Center LE	●/●	●/●	○	●	●	5	10/●	○
○	●/●/●	Comit Lite for Windows, WinFax Lite	○/○	○/○	○	○	○	2	10/●	○
●	●/●/○	FaxWorks 3.0	○/○	○/○	○	●	○	5	12/○	○
○	●/●/○	FaxWorks 3.0	○/○	○/○	○	○	○	5	10.5/○	○
○	●/●/○	FaxWorks 3.0	●/●	●/○	○	○	○	5	10.5/○	○

❽ Microcom DeskPorte 28.8S

PRO: Nice price

CON: Legacy card, comes with few extras

IF YOU'RE LOOKING FOR A MODEM with all the latest features and no installation headaches, this isn't it. The plain-language manuals help ease installation pains—but you have to know how to mind your COM ports and IRQs. If you have to call tech support, it's available 12 hours a day on weekdays, but it's a toll call.

The $143 DeskPorte has two redeeming features: It's quite affordable, and it includes the FaxWorks 3.0 package, one of the most capable and easiest to learn of the programs commonly bundled with modems. The DeskPorte also supports MNP-10EC, useful for people who send data over cellular connections. Performance is average among the modems on the Top 10 chart. *Microcom, 800/822-8224, http://www.microcom.com*

READER SERVICE NO. 727

❾ Boca Bocamodem V.34 28800bps

PRO: Good performance, very good documentation, easy installation

CON: Pricey for a basic modem that doesn't offer Plug and Play

BOCA'S LATEST PRODUCT ISN'T MUCH MODEM for the money. That's both good and bad.

Good because the Bocamodem V.34 28800bps is physically the smallest modem in the roundup. Measuring only 4.5 inches long, its small size can be a plus if you have a computer jam-packed with cards, cables, and other clutter.

Bad because this expensive $179 card lacks Plug and Play and is 8-bit, which means it can't use any IRQs above 7—a problem if your PC has a lot of other devices.

SIZE CAN MAKE A DIFFERENCE when it comes to putting modems into PCs. Longer modems can be harder to install because of interference from cables, CPU heat sinks, and cache RAM modules.

The Bocamodem cranked through a megabyte of data a couple of seconds per megabyte faster than the average Top 10 modem, and its manual is very readable. But for a little more money, you can get modems with the works from Boca and several other vendors. *Boca, 561/997-7202, http://www.bocaresearch.com*

READER SERVICE NO. 728

❿ Boca V.34 Office Communicator

PRO: Voice mail, speakerphone, VoiceView, FaxWorks 3.0

CON: Expensive, subpar performance, longest card on chart

BOCA'S SECOND OFFERING this month, the $199 V.34 Office Communicator, is more amply featured. But if voice mail, speakerphone capabilities, and VoiceView are what you're looking for, you'll get more value from the Cardinal MVP288IS, a Best Buy this month that costs a little less and offers much more.

The Office Communicator is a 16-bit Plug and Play card, but it installed smoothly on only two of the five installation test beds. Performance was nothing to rave about—the unit was 5 seconds slower than the typical Top 10 modem. Also, you may have trouble fitting this 11.3-inch card into your computer.

Boca made a good choice of software: The bundled FaxWorks 3.0 program is easy to use and combines voice, fax, and e-mail in one—it's one of the best bundled fax/data packages available. You can also set the modem to call your beeper when you get new messages on your PC. *Boca, 561/997-7202, http://www.bocaresearch.com*

READER SERVICE NO. 729 ■

The Sportster Winmodem *Prefers Pentiums*

A 33.6-KBPS MODEM for $99? When U.S. Robotics told us its Sportster Winmodem price, we asked what digit was missing.

But there's a catch: How well it works depends on how powerful your PC is. U.S. Robotics was up-front in saying that you'll need a Pentium if you plan on running lots of CPU-intensive apps. The Winmodem lacks a controller chip, leaving it up to the CPU to juggle extra duties.

We decided to perform some informal stress tests on the 33.6-kbps Winmodem. To see what happened to the computer and modem performance on PCs using different CPUs, we installed the Winmodem on a Quantex Pentium-166 and a Gateway 2000 486DX2-66V. Then we downloaded a 200K file from CompuServe, first with no other applications loaded and then while simultaneously running the Hover 3D game and a demanding Excel macro packed with trigonometric functions. On the P-166, both download times and foreground operations appeared unaffected by the extra demand on the CPU. On the 486 with only the Excel macro running in the foreground, the Winmodem didn't suffer much performance loss. However, when we ran the macro and the 3-D game together on the 486, download time for the 200K file jumped from 30 to 40 seconds, and Hover bogged down so much it was unplayable.

Based on the results of these informal tests, we removed the Winmodem and other future PC-dependent modems from Top 10 competition until we can create a realistic benchmark that will put standard and computer-dependent modems on the same footing. Nonetheless, we found out that the U.S. Robotics Winmodem is a good performer on a very fast Pentium machine, and it may do well even on slower Pentiums. **—Eric Hellweg and Kirk Steers**

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*Model 6E3/6R3. [1]Estimated IBM authorized retailer price. Actual prices may vary. Other models range up to $2,949. [2]Processor internal clock speed. Application speed will be less. [3]On selected models. [4]MB=million bytes, GB=billion bytes. [5]SmartSuite may be preloaded, included on a CD, or available to order on a CD. Diskettes and hard copy documentation available at extra charge. [6]M-F, 8 am-8 pm EST. In Canada, call 1 800 465-3299 (ID# 45294). Also supports Windows NT v3.51, v4.0 (when available). IBM, ThinkPad, TrackPoint III and Solutions for a small planet are trademarks of International Business Machines Corporation. Microsoft and Windows are trademarks or registered trademarks of Microsoft Corporation. Other companies, products and service names may be trademarks or service marks of others. © 1996 IBM Corp.

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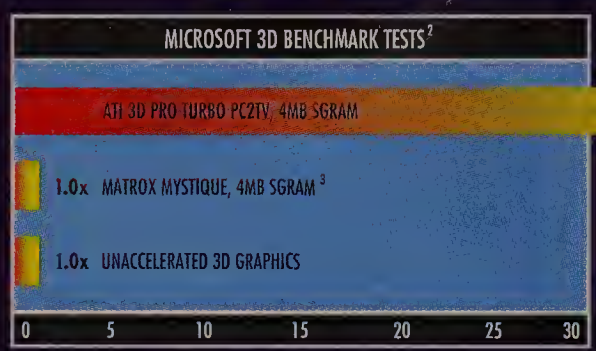
	ATI 3D XPRESSION PC2TV	MATROX MYSTIQUE	DIAMOND STEALTH 3D 2000XL	ATI 3D PRO TURBO PC2TV	MATROX MILLENNIUM
Output to TV	●			●	
1600 x 1200 (NI)	●			●	●
3D Texturing (Bilinear)	●		●	●	
Smooth Video	●	●		●	
Performance (WinMarks)[1]	40.7M	35.9M	33.6M	41.5M	37.7M
Price	$219 (2MB)	$219	$199	$349 (4MB)	$449



COMPARISON	3D XPRESSION PC2TV	3D PRO TURBO PC2TV
Use	Games, Home, Business	Power Users, Engineers, Graphics Professionals
Maximum 3D Resolution and Colors[4]	1024 x 768 @ 256	1600 x 1200 @ 256
Maximum Resolution	1600 x 1200 @ 60Hz	1600 x 1200 @ 75Hz
Memory	2MB or 4MB (2MB upgradable to 4MB)	4MB Upgradable to 6MB or 8MB

© ATI Technologies Inc., 1996 ATI, 3D PRO TURBO, 3D XPRESSION and PC2TV are trademarks and/or registered trademarks of their respective manufacturers. 1. All performance tests conducted by ATI on a P5-200MHz system with 32MB EDO RAM, 256K cache. The 3D XPRESSION PC2TV, Matrox Mystique and Diamond Stealth 3D 2000 are configured with 2MB of memory and the 3D PRO TURBO PC2TV and Matrox Millennium with 4MB of memory, for PCI bus using driver release: 3.0, 1.0, 4.0, 3.0 and 2.2 respectively. WinBench tests conducted at 1024x768 resolution at 256 colors at 75Hz refresh under Windows 95. 2. Test conducted on a P5-75MHz system with Microsoft Tunnel Test in 640x480 resolution at 65K colors in bilinear. 3. Bilinear texturing not supported in hardware. 4. Double buffered with 16-bit Z-buffer.

Circle 5 on reader service card

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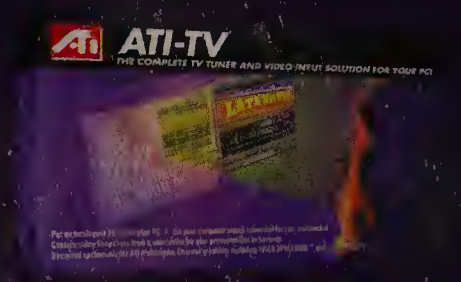

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Circle 25 on reader service card

A monthly update of the best desktop PCs, notebooks, printers, monitors, graphics boards, and modems

PC WORLD

TOP 100

212 Power Desktops

226 Budget Desktops

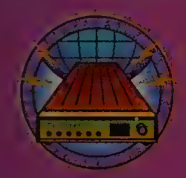
242 Notebooks

263 Printers

267 Monitors

271 Graphics Boards

273 Modems



THE NEW NOTEBOOKS

Many Shapes, Many Sizes

ANY WAY YOU LIKE IT: Compaq's highly configurable Armada 4120T takes up to three batteries.

PHOTO: MARC SIMON; ICONS: JEFFREY PELO

EDITED BY REX FARRANCE

A CERTAIN FORMER CALIFORNIA governor once declared, "You've seen one redwood, you've seen them all." Sometimes we feel that way about PCs. Despite vendors' recent efforts to dress up their systems with designer colors and stylish front panels, PCs all look basically the same: big boxes with an on/off switch. Notebooks, on the other hand, can take many forms. Notebook ven- ▶

dors face the challenge of stuffing the contents of a desktop computer into something the size of a loose-leaf binder. How they solve this problem yields all manner of unusual notebook designs.

Take Compaq's new Armada line. The Armadas take a sort of Lego set approach to portable computing. Depending on how much battery life, sound, and video you want to take with you, you can configure your Armada in any of several ways. Want a fast, very light, basic machine to do a few hours of spreadsheet work? That's the 5-pound Armada, with one battery and no floppy drive. Want to increase its on-the-road longevity? Attach the Armada's handle, which holds a second lithium ion battery.

The final piece in the Armada ensemble is a multimedia base that adds a CD-ROM drive. Many vendors offer CD-ROM docking stations, but they're not very portable. The Armada's base is not only much lighter and thinner than traditional docking stations, but it holds yet another battery. According to Compaq, the trio of power supplies should give you at least 10 hours of operation—long enough to keep you crunching on a coast-to-coast flight and back.

COMPAQ'S QV210: A terrifically sharp picture helps make it our number two monitor, despite its steep $1825 price.

For this month's Top 20 we tested the Pentium-120 version of the Armada, the $4298 4120T. The screen looked good, and the unit performed fairly well for a Pentium-120. It would have ranked higher than eighth on our Power Notebooks chart if it had been slightly faster, a little less expensive, and a bit lighter.

Not all new notebooks are headed in the direction of the Armada. With this month's new number three budget portable, the ThinkPad 560, IBM goes the traditional route of trying to make the smallest notebook possible without sacrificing too many essentials. A remarkable 1.3 inches thick, the $2699 ThinkPad 560 doesn't have a built-in floppy, but it weighs less than 6 pounds and its keyboard and screen are big.

UPDATING SERVICE AND RELIABILITY

EACH MONTH PC WORLD polls readers to find out how reliable their PCs have been and what kind of service they're getting (see the Reliability and Service Survey). You can see the results of this fax-back survey in two places: in the reliability and service and support scores we give vendors in our Top 20 tables, and in biannual articles that delve more deeply into support trends.

YOUR GUIDE TO THE TOP 100

QUESTIONS ABOUT OUR CHARTS? The following section should answer most of them. If not, ask us; see page 12 for contact information.

How do the charts work? The Top 20 and Top 10 charts are evolving lists of the best PCs, monitors, modems, printers, and graphics boards we've tested. Every month we test the latest products in each category and compare them to the pool of items we've already reviewed. As new products earn places on the charts, those at the bottom drop off. Price cuts also cause chart changes.

Where do you get your prices? We estimate street prices based on vendor information and our own research, including surveys of retail outlets. We recheck all prices every month.

What does the overall rating mean? It's the sum of all our tests—both hands-on evaluations and automated speed tests. The scale is 1 to 100, so a product that scores in the 90s is generally considered exceptional, one in the 80s is among the best, one in the 70s is above average, and one that scores lower usually doesn't place.

What does the PC WorldBench score mean? It's a measure of how fast a PC is in relation to our baseline machine, a Dell P75t configured with 8MB of RAM, a 540MB hard drive, and no secondary cache. A PC that scores 200, for instance, is twice as fast as the baseline unit.

Where do the reliability and service and support scores for PCs come from? The reliability score and the "service" portion of the service and support score come from readers who respond to the Reliability and Service fax-back survey in each issue of *PC World*. The "support" portion of the service and support score is based on the vendor's support policies (such as length of warranty and support hours).

What do all those word scores mean? Word scores for performance and price are based on a product's rating in relation to other products in its category. For example, a budget PC that is rated "expensive" is high-priced only in relation to other budget PCs. Likewise, a power notebook rated "good" for performance is good only in relation to other power notebooks. Word scores for other categories, such as features, are relative to all desktops or all notebooks.

Where can I find the online version of the Top 100? Go to PC World Online (http://www.pcworld.com). There you'll find not only the current issue of *PC World* and reviews for the last 18 months, but some extra features you'll want to check out. For one thing, PC World Online includes reviews you won't find in print. If a product misses a chart and we don't cover it here, you can go directly to an online review by using the URL provided in each Top 100 section.

ROLLING YOUR OWN CHARTS

HAVE YOU EVER WISHED you could build your own chart based on your buying criteria? Now you can, with Personal Shopper, our Web site's unique chart customizer. Personal Shopper combines your criteria with *PC World*'s current data and test results to generate customized Top 20s and Top 10s. For instance, if you want your chart to rank notebooks that have 120-MHz processors, 1.6GB hard drives, and 28.8-kbps modems, Personal Shopper will find and rank all the machines that fit your specifications.

This month we've updated our Top 20 service and reliability ratings to reflect the latest survey results. We've also adjusted our scoring scheme slightly so that our word ratings now match those we use for the biannual articles. As a result, you'll see some changes in reliability and service and support ratings for several major vendors. A few, including Dell and Micron, have improved quite a bit. Others remain unchanged, including Gateway 2000, whose reliability continues to rate only fair.

NOW ANYONE CAN OWN a Pentium-200, such as Dell's Dimension P200v, our number two budget machine at only $1999.

SAME CHART TOPPERS

NEW SERVICE and reliability ratings, reduced prices, and a healthy influx of new PCs brought lots of changes to our Top 20 charts this month. About the only things that remained constant were our number one Best Buys, which held their ground on every chart. A Pentium-200 machine, Dell's $2949 Dimension XPS P200s, remains our top power desktop, due in part to a $380 price drop since we first tested it in September. On the Budget Desktops chart, Micron's P133 Millennia, an $1899 Pentium-133, is still the best value in the under-$2500 category.

Dell's Latitude LM P133ST stays at number one on our Power Notebooks list. A $200 price drop helps Toshiba's Satellite 100CS retain its top spot on the Budget Notebooks chart.

Sixteen new systems cracked our Top 20s. On the Power Desktops list, new Pentium-200 systems from Compaq and Gateway 2000 and a Pentium-200 knockoff that uses a Cyrix chip made the chart. Compaq's $3218 Deskpro 5200/1080 debuts highest, in sixth place, almost a Best Buy. It's the first Compaq we've seen that uses the attractive new Deskpro case design. It's also one of the fastest P-200s we've tested, but it's configured strictly for business. Sound card, speakers, modem, and even applications cost extra.

P-200S BECOME BEST BUDGET BUYS

THREE NEW PCS debut at the top of the Budget Desktops chart this month. The most notable: Dell's $1999 Dimension P200v, the first budget-price Pentium-200 to earn a Best Buy. The P200v is a good value if your needs don't go beyond basic business graphics.

Quantex's $2249 QP5/120 M-4 slides into fourth place. This Pentium-120 is a good buy overall except for the below-average service rating *PC World* readers give the company. Quantex says a beefed-up tech staff will take care of that soon. Our fifth-place budget Best Buy, the $1864 Gateway 2000 P5-133, shares many good qualities of its Pentium-200 sibling on the Power chart and costs $1135 less. It's very fast and looks great, but readers say Gateway's computers could be more reliable.

Our biggest surprise after testing internal modems for the first time this month: Many don't plug and play, even though they're supposed to.

In addition to Compaq's Armada 4120T and IBM's ThinkPad 560, a slew of other new notebooks did well enough to make the Top 20. New arrivals occupy half the Budget Notebooks chart. IBM scored twice—once with the ThinkPad 365E, our new number two Best Buy, and again with the new ThinkPad 560, which took over third place. The ThinkPad 365E, a Pentium-75 wanna-be equipped with a Cyrix CPU, is a fine entry-level portable whose greatest attribute is its big, comfortable keyboard.

By the time you read this, the first notebooks with a P-150 chip should be available (see "150-MHz Notebooks Are Fast, but Are They Worth It?"). Look for our first review of a P-150 notebook, Dell's new Latitude LM XPI P150, in next month's Top 20.

MOVING TO THE BIG SCREEN

NOT TOO MANY people own 20-inch monitors yet, but as prices continue to fall (to as low as $1100), these big screens don't seem so out of reach. For this month's Top 10 Monitors, we evaluated 14 20- and 21-inch monitors with the same expanded tests we used recently on 15- and 17-inch monitors. Our new number one big monitor: Samsung's SyncMaster 20GLsi. At $1285, it's one of the most affordable 20-inch monitors we've looked at, and it displays graphics with impressive clarity.

This month we expanded our modem coverage to include internal modems. In "Fast and Cheap: Top Modems for Tight Budgets," we evaluate 14 of the most popular 28.8- and 33.6-kbps internal modems on speed and ease of installation. To see how they ranked, check the Top 10 Modems chart in this Top 100 section. Our biggest surprise involved Plug and Play: Many internal modems lack this feature, even though they're supposed to have it. Two that do Plug and Play are our two Best Buys, Motorola's LifeStyle 28.8 and Cardinal's MVP288IS. Both are easy to set up and a pleasure to use.

Rex Farrance is a senior associate editor for PC World. *Editorial Assistant Allyson Bates, Staff Editor John Goddard, Associate Editors Brad Grimes and Melissa Riofrio, Senior Associate Editor Bryan Hastings, Assistant Editor Eric Hellweg, and freelance writers Geoffrey Coffey and Jon J. Jacobi contributed to the Top 100. Testing for the Top 100 by Dave Casini, Ulrike Diehlmann, Jeffrey Kuta, Kevin Mitchell, Mike Salayko, and Susan Silvius.* *See page 12 for contact information.*

PC WORLD

TOP 20 POWER DESKTOPS

	SYSTEMS	Last month	Month tested	Street price (8/14/96)	CPU	Comments
1	Dell Dimension XPS P200s 800/613-3355 www.dell.com	1	Sept 96	$2949	Pentium-200	$380 price drop keeps this PC at the top; fast; high-quality components.
2	Micron P200 Millennia 800/223-6571 www.micron.com	3	Sept 96	$2549	Pentium-200	Quick for a P-200 with 16MB of RAM; good 3-D graphics.
3	Dell OptiPlex GXpro 200 800/613-3355 www.dell.com	2	Aug 96	$4110	Pentium Pro-200	$422 price drop, fastest system to date, modular design, built-in networking.
4	Dell OptiPlex GXMT 5200 800/613-3355 www.dell.com	4	Sept 96	$4031	Pentium-200	Fast, networkable right out of the box; can't add many PCI cards.
5	Dell Dimension XPS Pro200n 800/613-3355 www.dell.com	5	Aug 96	$3199	Pentium Pro-200	$300 price drop; well designed; fast, but other Pentium Pro-200s are faster.
6	Compaq Deskpro 5200/1080 800/345-1518 www.compaq.com	–	new	$3218	Pentium-200	No sound, but great performance, high reliability rating, and clean design.
7	Micron P166 Millennia Plus 800/223-6571 www.micron.com	7	Mar 96	$3298	Pentium-166	SCSI Millennia priced with an Iomega Jaz drive; reliability rating is now higher.
8	Gateway 2000 P5-200 800/846-2000 www.gw2K.com	–	new	$2999	Pentium-200	Well-designed multimedia tower with big hard drive; reliability only fair.
9	HP Vectra VL4 5/200MT 800/752-0900 www.hp.com	–	Sept 96	$3192	Pentium-200	Price has dropped by more than $900; P-166 version is also good.
10	Cyrix 6x86 P200+ 800/340-7501 www.cyrix.com	–	new	$5169	Cx6x86-P200+	Skip the pricey 64MB caching hard disk controller and buy a bigger monitor.
11	HP Vectra 500 Model 515MCx 5/166 800/752-0900 www.hp.com	11	July 96	$3212	Pentium-166	$218 price drop on small-business PC; includes voice mail.
12	ZDS Z-Station GT 500 800/533-0331 www.zds.com	12	Sept 96	$3570	Pentium-200	Fast and well put together, except the add-in cards—they're upside down.
13	Quantex QP5-200 SM-2 800/896-4898 www.quantex.com	10	Sept 96	$2999	Pentium-200	$100 off, loaded with extras, very fast; reliability rating hurts.
14	Quantex QP6-200 Pro 800/896-4898 www.quantex.com	8	Aug 96	$3199	Pentium Pro-200	Better speed and features than number five Dell; reliability rating much lower.
15	IBM PC 350 800/426-2968 www.ibm.com	9	Sept 96	$3903	Pentium-200	Fast PC features new technologies like Universal Serial Bus, but still expensive.
16	Tangent MediaGem 800/829-2850 www.tangent.com	14	Sept 96	$2695	Pentium-200	$200 price drop, fastest P-200 we've tested, built-in speakers and video input.
17	NEC PowerMate P166 800/632-4636 www.nec.com	15	Aug 96	$2659	Pentium-166	$265 off; good-quality components, but so-so P-166 performance.
18	Multiwave Ultra Power 800/234-3358 www.mwave.com	16	Oct 96	$2520	Pentium-200	Fast multimedia system with 33.6-kbps modem, near-budget price.
19	Netis N5166 Power Station 800/577-7526 www.netistech.com	–	Oct 96	$2529	Pentium-166	$222 price drop almost makes it a budget PC; great graphics card.
20	Xi Computer Pro-200 MTower SP 800/432-0486 www.win.net/xi_comp	17	July 96	$4199	Pentium Pro-200	Sturdy Pro-200 with SCSI hard drive is fast; expensive even after $600 drop.

Best Buy See features chart, page 214; performance chart, page 218. Recommended as home system

[1] To order fax copies of system reviews, call 800/434-4495 from a touch-tone phone and use your credit card. You can order next month's reviews in advance: Power Desktops, Budget Desktops, or Notebook PCs Top 20 charts and capsule reviews ($9.95, available October 30).

THE DAYS OF PENTIUM-133s as power machines are long gone. If you want to play with the big kids—PCs priced over $2500—you have to be as fast, and P-133s just can't keep up with Pentium-200s. That's why Digital's new Venturis FX-5133 didn't stand a chance at a spot on our Power Desktops chart this month. We liked it overall, but at $2867 it's priced well above what most people will pay for a P-133 these days, considering that you can now find a P-200 for the same price. Four other power systems didn't make our cut, including the $4350 Everex Pentium Pro 200, one of the first PCs we've seen with the new Universal Serial Bus port. For details, visit PC World Online (http://www.pcworld.com/t20pcsnaps).

SCORECARD

Overall rating	PC World-Bench score/ performance	Vendor's system reliability	Features and design	Price	Vendor's service and support	Fax reprint number [1]	Reader service number
90	208/very good	best	outstanding	average	best	3415	611
90	210/very good	best	outstanding	inexpensive	best	3416	612
90	232/outstanding	best	outstanding	expensive	best	3401	613
88	216/very good	best	outstanding	expensive	best	3417	614
88	211/very good	best	very good	average	best	3402	615
87	218/very good	best	very good	average	good	3442	616
87	198/good	best	outstanding	average	best	3331	617
85	218/very good	fair	outstanding	average	good	3443	618
83	201/good	best	very good	average	fair	3421	619
83	223/very good	[2]	outstanding	very expensive	[2]	3444	620
82	192/good	best	very good	average	fair	3383	621
82	215/very good	good	outstanding	average	fair [3]	3420	622
82	216/very good	poor	outstanding	average	fair	3445	623
81	224/very good	poor	outstanding	average	fair	3405	624
81	215/very good	fair	very good	expensive	good	3419	–
79	220/very good	[2]	outstanding	inexpensive	[2]	3423	626
79	194/good	fair	very good	inexpensive	fair	3406	627
79	215/very good	[2]	outstanding	inexpensive	[2]	3430	628
79	206/good	[2]	outstanding	inexpensive	[2]	3446	629
78	221/very good	[2]	outstanding	expensive	[2]	3407	630
Scorecard weightings	Performance 25 percent	Reliability 25 percent	Features 20 percent	Price 15 percent	Support 15 percent	All products:	902

[2] Insufficient data.
[3] Limited data; score is based on responses for this company and average of all companies.

This Month's Best Buys

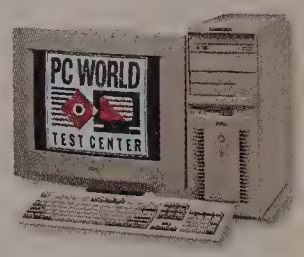
NO. 1: DELL DIMENSION XPS P200S

PRO: Improved case design, fast graphics card

CON: Slower than expected, no speakers

Dell's Dimension XPS P200s keeps the title of number one power desktop for the third month in a row, thanks in part to a $380 price drop. The $2949 XPS P200s is the top-end PC in Dell's new "s" series, the follow-on to the well-regarded "c" line of Dells that topped our charts for months. A stylish, nicely configured business machine, the P200s is not the fastest PC in its class, despite having SDRAM, a type of main memory that's faster than today's popular EDO DRAM. But it's still very fast, and comes with several enhancements that its predecessors lacked, including a more logical exterior design.

Our test system came full of high-quality components, including a Number Nine Imagine 128 Series 2 graphics card with 4MB of VRAM. This board can handle all your graphics chores, including 3-D applications.



Dell XPS P200s

The "s" series is better thought out than the "c" line was. For instance, the old on/off button, which resembled a floppy eject button, has been replaced with a circular, slightly recessed button located smack in the middle of the front panel and far from the floppy drive, so you won't turn off your PC accidentally.

Dell gets fine service and reliability scores from our readers. Documentation is well done, and the software bundled with this system is the well-regarded Microsoft Office. Don't want to spend quite as much? We recommend the Dimension XPS 166s, configured similarly but costing $200 less.

NO. 2: MICRON P200 MILLENNIA

PRO: Priced near the budget level, big hard drive, 8X CD-ROM drive, 3-D graphics card

CON: No modem

Improved reliability and service scores, based on reader feedback, move the $2549 Micron P200 Millennia up another step to become this month's number two power desktop Best Buy. The P200 also owes its high rank to a sturdy design, good configuration, one of the lowest prices on the Power Desktops chart, and good speed for a system equipped with 16MB of RAM (many P-200s now come with 32MB).

Micron P200

As with the Dell P200s, one of the best things about the P200 Millennia is its graphics card. It's the first PC we tested that uses the Diamond Stealth 3D 2000, a board that combines exceptional Windows graphics performance with 3-D acceleration. The Stealth 3D can't ▶

TOP 20 POWER DESKTOPS — STANDARD FEATURES

	SYSTEMS	CPU	RAM (MB)	Secondary cache (K)	Hard drive (GB)	Graphics adapter	Video RAM (MB/type)	Monitor tube/ viewable diagonal (inches)	Screen pitch (mm)	CD-ROM drive speed
1	Dell Dimension XPS P200s*	Pentium-200	16	512	2.6	Number Nine Imagine 128 Series 2	4/VRAM	17/15.3	.28	8X
2	Micron P200 Millennia*	Pentium-200	16	512	2.5	Diamond Stealth 3D 2000	2/EDO DRAM	17/15.9	.26	8X
3	Dell OptiPlex GXpro 200*	Pentium Pro-200	32	256	2.1	Number Nine Imagine 128 Series 2	4/VRAM	17/15.6	.28	4X
4	Dell OptiPlex GXMT 5200*	Pentium-200	32	512	2.1	Number Nine Imagine 128 Series 2	4/VRAM	17/15.6	.28	8X
5	Dell Dimension XPS Pro200n*	Pentium Pro-200	32	256	2.1	Number Nine Imagine 128 Series 2	4/VRAM	17/15.3	.28	8X
6	Compaq Deskpro 5200/1080	Pentium-200	32	256	1.1	integrated Cirrus Logic 5436	2/EDO DRAM	15/14	.28	8X
7	Micron P166 Millennia Plus	Pentium-166	16	512	2.2	Diamond Stealth64 Video VRAM	2/VRAM	15/13.6	.28	8X
8	Gateway 2000 P5-200	Pentium-200	32	512	3.2	Matrox MGA Millennium	2/WRAM	17/16	.25	8X
9	HP Vectra VL4 5/200MT	Pentium-200	16	256	2.5	Matrox MGA Millennium	2/WRAM	15/13.5	.28	4X
10	Cyrix 6x86 P200+	Cx6x86-P200+	32	256	4.1	Matrox MGA Millennium	2/WRAM	15/14	.28	8X
11	HP Vectra 500 Model 515MCx 5/166	Pentium-166	16	256	1.6	integrated Trio64	1/DRAM	15/13.7	.28	4X
12	ZDS Z-Station GT 500	Pentium-200	32	256	2.6	integrated ATI-264VT	2/SGRAM	17/15.5	.26	8X
13	Quantex QP5-200 SM-2	Pentium-200	32	512	2.6	ST8 Lightspeed 128	2/MDRAM	17/16	.26	8X
14	Quantex QP6-200 Pro	Pentium Pro-200	32	256	2.6	STB Lightspeed 128	2/MDRAM	17/16.1	.26	6X
15	IBM PC 350	Pentium-200	32	512	1.6	integrated Trio64V+	2/EDO DRAM	17/15.5	.28	6X
16	Tangent MediaGem	Pentium-200	32	512	2.1	ST8 Lightspeed 128	2/MDRAM	17/15.6	.28	6X
17	NEC PowerMate P166	Pentium-166	16	256	2.1	Matrox MGA Millennium	4/WRAM	15/13.5	.28	6X
18	Multiwave Ultra Power	Pentium-200	16	256	1.3	ST8 Lightspeed 128	2/MDRAM	17/16.2	.27	8X
19	Netis N5166 Power Station	Pentium-166	16	512	2.1	Matrox MGA Millennium	2/WRAM	17/15.8	.28	6X
20	Xi Computer Pro-200 MTower SP	Pentium Pro-200	32	256	4.3	Matrox MGA Millennium	4/WRAM	17/15.7	.25	6X

*Best Buy

match cards made for 3-D–intensive games, but it makes the P200 Millennia a fine choice for smooth, basic 3-D in presentations, Web sites, CAD programs, and games.

The system is well designed. The minitower case is narrower and taller than most that we've seen, but it's still easy to upgrade. A wide foot at the bottom helps prevent tipping. The multimedia ports are installed high on the back of the case to make them easier to get to. In addition to offering round-the-clock technical support and a good standard warranty, Micron bundles Microsoft Office Professional, Bookshelf, and the Plus Pack with all its Millennias.

Dell GXpro 200

NO. 3: DELL OPTIPLEX GXPRO 200

PRO: Fast, great design, integrated networking

CON: Expensive, slow CD-ROM drive

The GXpro is a very fast, easily upgradable powerhouse designed to work well in a corporate environment. It comes with some nice components, including integrated sound and speakers, but don't count on them for the ultimate multimedia experience. Dell puts most of the muscle behind this $4110 Pentium Pro-200 machine into a LAN connection and a terrific new interior design that network administrators will love.

With a PC WorldBench score of 232, the GXpro is the fastest system we've tested. It's more than 10 percent quicker than the fastest Pentium-166 we've tested, and 5 percent quicker than the top Pentium-200. The graphics hardware is above-average—a Number Nine Imagine 128 Series 2 graphics card with 4MB of VRAM and a bright, crisp 17-inch Dell D1728D monitor—but most of the configuration is geared toward business. The PC comes ready to plug into your network with an integrated 3Com ethernet adapter. The integrated Vibra 16 sound chip and Altec Lansing ACS 31 speakers are fairly plain, and the quad-speed CD-ROM drive that came with our test machine is slow by today's standards.

The GXpro's new desktop design is a vast improvement over previous systems. It's one of the most easy-to-upgrade PCs

		EXPANDABILITY						CUSTOMER SUPPORT			
Modem speed (kbps)	Sound board	Case style	Max. RAM (MB)	Maximum secondary cache (K)	Open RAM sockets	Open drive bays (ext./int.)	Open slots	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
28.8	Integrated Vibra 16	minitower	64	512	1	3/1	4	3/1	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	Creative Labs Vibra 16	minitower	128	512	2	3/1	5	3/1	24	Sat., Sun.	BBS, WWW
–	Integrated Vibra 16	desktop	512	256	3	1/1	4	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	Integrated Vibra 16	minitower	128	512	2	3/1	5	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	–	minitower	128	512	2	3/1	6	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	–	compact	128	256	2	2/0	5	3/1	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	Sound Blaster AWE32	minitower	128	512	2	1/1	5	3/1	24	Sat., Sun.	BBS, WWW
28.8	Ensoniq Soundscape Vivo	tower	256	512	0	2/6	2	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	Sound Blaster 16	minitower	128	512	4	2/1	4	3/3	11	–	AOL, BBS, CIS, WWW
–	Sound Blaster AWE32	minitower	256	512	0	1/3	4	3/3	24	Sat., Sun.	BBS, WWW
28.8	Sound Blaster 16	minitower	128	256	4	2/1	4	1/1	16	Sat.	AOL, BBS, CIS, WWW
–	Creative Labs Vibra 16	minitower	192	512	4	4/1	5	3/3	24	–	BBS, CIS, MSN, WWW
28.8	Ensoniq Soundscape Vivo	minitower	128	512	0	3/2	4	3/1	15	Sat., Sun.	BBS, Prodigy, WWW
28.8	Ensoniq Soundscape Vivo	minitower	128	256	0	2/1	3	3/1	15	Sat., Sun.	BBS, Prodigy, WWW
–	–	desktop	142	512	4	1/1	5	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	Sound Blaster 32 PnP	desktop	512	512	6	1/1	6	3/3	11	Sat.	BBS, WWW
–	Integrated OPTi 82C930	minitower	128	512	2	2/2	4	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
33.6	Ensoniq Soundscape Vivo	minitower	512	256	2	3/1	4	1/1	11	Sat.	BBS, WWW
28.8	Vibra 16S Plug and Play	minitower	128	512	2	3/1	5	1/3	10	Sat.	BBS, WWW
28.8	Sound Blaster AWE32	minitower	512	256	2	5/1	2	3/3	9	Sat.	WWW

we've seen. The case is simple to remove, and the internal construction is modular. Cards are housed on a vertical riser plane that slides out at the touch of a lever. Even the power supply swings aside for effortless access to the motherboard and drive bays. Like the Dimension XPS P200s, the GXpro uses DIMM memory modules.

NO. 4: DELL OPTIPLEX GXMT 5200

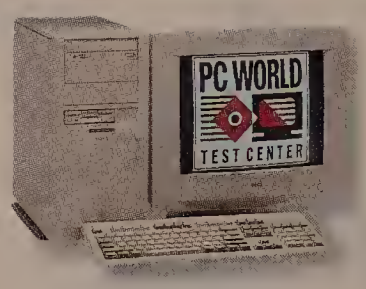
PRO: Fast, built-in networking, hot graphics card

CON: Expensive

The Pentium-200 model in Dell's network-ready OptiPlex GXMT line is a real greyhound. With a PC WorldBench score of 216, it's one of the fastest P-200 systems we've tested. While its less expensive sibling, the $2464 OptiPlex GXMT 5166, also is a good value, the $4031 OptiPlex GXMT 5200 races right past it to earn a Best Buy.

The high performance of our test system was helped along by the unit's copious amount of RAM, big secondary cache, and Number Nine Imagine 128 Series 2 graphics board with 4MB of VRAM. While Dell has yet to upgrade all its OptiPlex systems to faster CD-ROM drives, the GXMT 5200 now includes an 8X CD-ROM drive, which replaces the slower quad-speed model it used to come with.

The minitower case is sturdy and easy to open, and the 3Com ethernet adapter is integrated, saving you an expansion slot.



Dell GXMT 5200

The expansion slots hover above the motherboard on a daughtercard so you don't have to worry about system chips getting in the way of longer boards.

As with all its OptiPlexes, Dell backs the GXMT 5200 with a three-year warranty.

NO. 5: DELL DIMENSION XPS PRO200N

PRO: Improved design, big hard drive, powerful and capable graphics card

CON: Sluggish for a Pentium Pro-200

For a loaded Pentium Pro-200 that's as well built as this one, $3199 is a good deal (and $300 cheaper than last month's price). The ▶

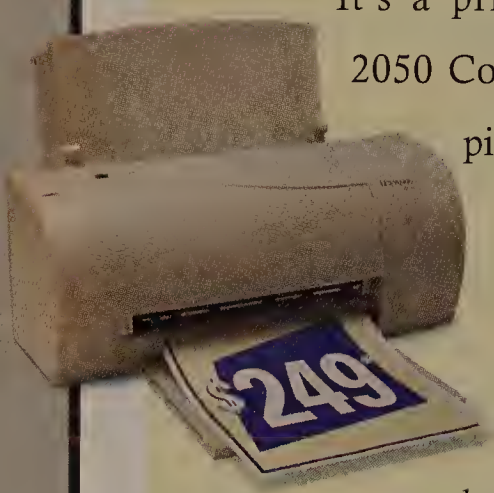
HOW TO SELL YOUR

STEP # 1

What is a Lexmark?

Lex•mark (leks•märk) n \

It's a printer, like the 2050 Color Jetprinter™ pictured here. But if you didn't know that, don't sweat it. Research shows most people in the market for a good, affordable printer don't yet know our name. There's a reason. Lexmark® has been making printers for business applications for years. (Our printers print about 100 million pages a day for banks, pharmacies and other big businesses.) And now we're applying that experience to small-office and home printers.



The Lexmark 2050 Color Jetprinter.

Step # 2

OVERCOMING OBSTACLES

"I kinda like the Epson.®"

"The Canon® is pretty good."

"I'd go with HP.®"

"Lexmark? Never heard of it."

Talk to most people and you're bound to hear the same few names come up again and again. And we admit they make good products. But frankly, we wouldn't have entered the market if we didn't have something better to sell. (We may be unknown, but we're not stupid.) So how is the Lexmark 2050 better? For starters, it's a lot faster than the Epson 500. We use a patented waterproof black ink that's better than the ink used in the Canon 4200. And it comes with more software packages than the HP 682Cse. We even throw in a paper pack, so you can print great stuff the minute you get home.

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SELF A LEXMARK.

STEP #3

FINDING A LEXMARK PRINTER.

Look, we'll be honest. You may have to look a little harder to find a Lexmark. You may have to search high and low. But we're not complaining. We know we have to earn our place in the stores. So we do everything we can to make sure that when you do find one of our printers, it's worth the effort.

The Unknown CFO of Lexmark International, Inc.
The Unknown Printer Company.

STEP #4

GETTING THE BEST VALUE. A MESSAGE FROM OUR CHIEF FINANCIAL OFFICER.

"Although we can't promise it, you'll probably find Lexmark priced a few dollars less. And when you buy a 2050, you'll get 7 complete software packages that let you print everything from labels to comic books, do retouching on photos, and give you access to the Internet and World Wide Web. (Some of our competitors only give you limited software.) And we have a 24-hour exchange warranty. Why does Lexmark give you so much for less? Well, the answer is a little embarrassing. It's because you don't know who we are. We have to."

Step 5 CLOSING THE SALE AND COLLECTING YOUR COMMISSION!

If you're able to overcome all the obstacles and sell yourself a Lexmark 2050, we believe you should be rewarded. So write "I Sold Myself" on your registration card and we'll send you a coupon good for $5.00 off your next print cartridge. Consider it your commission for a job well done.

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Circle 132 on reader service card

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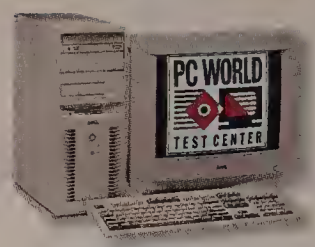
Dimension XPS Pro200n has a heavy helping of RAM, a big hard drive, an 8X CD-ROM drive, and a feature-rich Number Nine Imagine 128 Series 2 graphics card with 4MB of VRAM and support for full-motion video. Dell also bundles the Microsoft Office Professional suite of business applications so you can start working immediately.



Dell XPS Pro200n

The minitower setup—the same as that of the top-ranked Dimension XPS P200s—is a big improvement over previous Dimension designs. For one thing, to help you avoid accidental system shutoffs, it has a sensibly placed on/off button that can't be mistaken for a floppy eject. And the system's tidy new interior makes it easy to upgrade.

The performance of this Pentium Pro-200 is a little disappointing. The system's PC WorldBench score of 211 is the lowest of all the Pentium Pro-200s we've tested—and just 3 points higher than that of the number one Dimension XPS P200s, which uses a Pentium-200 processor. Still, the XPS Pro200n is a fast, loaded PC that carries a three-year warranty. You can save $50 by buying only a one-year warranty, but you have to ask for it. ▶

TOP 20 POWER DESKTOPS

	SYSTEMS	CPU	RAM (MB)	Secondary cache (K)	PC WorldBench score
1	Dell Dimension XPS P200s*	Pentium-200	16	512	208
2	Micron P200 Millennia*	Pentium-200	16	512	210
3	Dell OptiPlex GXpro 200*	Pentium Pro-200	32	256	232
4	Dell OptiPlex GXMT 5200*	Pentium-200	32	512	216
5	Dell Dimension XPS Pro200n*	Pentium Pro-200	32	256	211
6	Compaq Deskpro 5200/1080	Pentium-200	32	256	218
7	Micron P166 Millennia Plus	Pentium-166	16	512	198
8	Gateway 2000 P5-200	Pentium-200	32	512	218
9	HP Vectra VL4 5/200MT	Pentium-200	16	256	201
10	Cyrix 6x86 P200+	Cx6x86-P200+	32	256	223
11	HP Vectra 500 Model 515MCx 5/166	Pentium-166	16	256	192
12	ZDS Z-Station GT 500	Pentium-200	32	256	215
13	Quantex QP5-200 SM-2	Pentium-200	32	512	216
14	Quantex QP6-200 Pro	Pentium Pro-200	32	256	224
15	IBM PC 350	Pentium-200	32	512	215
16	Tangent MediaGem	Pentium-200	32	512	220
17	NEC PowerMate P166	Pentium-166	16	256	194
18	Multiwave Ultra Power	Pentium-200	16	256	215
19	Netis N5166 Power Station	Pentium-166	16	512	206
20	Xi Computer Pro-200 MTower SP	Pentium Pro-200	32	256	221

*Best Buy

PERFORMANCE

Word 7.0 for Windows 95
Excel 7.0 for Windows 95
Picture Publisher 6.0 for Windows 95
Paradox 5.0 for Windows
WordPerfect 6.1 for Windows
1-2-3 release 5 for Windows

HOW WE TEST All systems are tested with PC WorldBench, PC World's application-based benchmark. A higher PC WorldBench score is better. All PCs have Windows 95, and video resolution is set to 800 by 600 in 256 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC WorldBench score is a sum of the weighted result of each script: Word (25 percent), Excel (20 percent), Picture Publisher (15 percent), Paradox (15 percent), WordPerfect (15 percent), and 1-2-3 (10 percent). For more details on our benchmark and how we run it, see PC World Online (http://www.pcworld.com).

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S T U D I O W O R K S

MODEL	SCREEN	PITCH	MAX. FLICKER-FREE RESOLUTION
20i	20" (18.76" VIS)	.28mm dot	1280x1024 @ 76 Hz NI
78i/78m†	17" FST (15.7" VIS)	.26mm dot	1280x1024 @ 76 Hz NI
76i/76m†	17" FST (15.7" VIS)	.28mm dot	1024x768 @ 80 Hz NI
56i	15" FST (13.6" VIS)	.28mm dot	1024x768 @ 80 Hz NI
56m†	15" FST (13.6" VIS)	.28mm dot	1024x768 @ 80 Hz NI

† Built-in stereo amplifier and speakers. * Requires DDC compatible video card.
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New This Month

The following PCs made our Power Desktops chart for the first time this month. For previously tested PCs on the chart, visit our Web page at http://www.pcworld.com/t20pcs.

NO. 6: COMPAQ DESKPRO 5200/1080

PRO: Great performance, good support

CON: Small hard drive and monitor

The Compaq Deskpro 5200/1080 is a fast, well-built system that came very close to landing a Best Buy on this month's Power Desktops chart. Its configuration isn't as good as that of less expensive Pentium-200s on our list. But with a PC WorldBench score of 218, it performs well, and you can't beat its fine desktop construction or Compaq's highly readable manuals.

Compaq Deskpro

Our $3218 test unit came with a fairly basic configuration. The 1.1GB hard drive and 15-inch monitor are small for a high-end system. You'll have to pay extra for other niceties, like a sound card, speakers, a modem, and application software.

Compaq took a hint from its competitors and put a stylish new case on its latest high-end PC. The company's manuals are superb as always, but on-screen documentation leaves something to be desired. When we clicked what we expected to be the help system, we instead found electronic ads for hardware enhancements and support plan options. Compaq's support policies for this Deskpro are typical for the industry, which means they're fairly generous, including a three-year warranty on parts and one year for labor.

NO. 8: GATEWAY 2000 P5-200

PRO: Fast, nice design, great documentation, rich configuration

CON: Reliability only fair

This updated Pentium-200 system is a terrific combination of quality components, good design, speed, and a $2999 price. It would probably rank as a Best Buy if Gateway could improve its system reliability score in our surveys.

Like most Gateway PCs we review, the P5-200 performs near the top of its CPU class, with a PC WorldBench score of 218. Its construction is sturdy, the interior uncluttered. It also has one of the largest cooling fans we've seen. The SDRAM memory is supplied in DIMMS, which are easier and more flexible than the more common SIMMS when it comes to adding memory: You can add RAM one DIMM at a time, whereas SIMMs typically are installed in pairs. Our only criticism of the design is the case's tendency to flex when the cover is off.

Gateway 2000 P5-200

Gateway's printed documentation is terrific. The informative start-up guide has the feel of an owner's manual for a luxury car. And Gateway's software bundle is one of the best we know of for business use: Microsoft Office Professional and Bookshelf, plus Internet and fax software for the bundled Telepath II 28.8-kbps fax-modem with voice mail.

Gateway's warranty covers parts and labor for three years. A year of free on-site service also is part of the package, and the company provides round-the-clock technical support. Service and support now rates as good, due mostly to Gateway's extensive support policies. But readers still rate the company's system reliability as fair.

NO. 10: CYRIX 6X86 P200+

PRO: Terrifically fast hard-drive controller

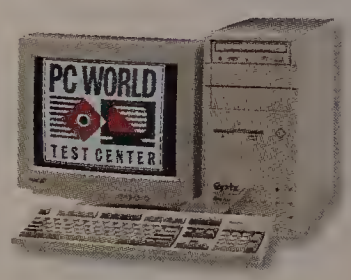
CON: Very expensive

This high-end Cyrix system is a good buy for power users who work with graphics programs or gigantic databases. It's one of the few systems we've tested that comes with a high-performance SCSI hard drive and adapter. But at $5169, it's a waste of money for anyone running common business applications. You can shave $1000 off the price by ordering it with a standard IDE drive.

That said, the Cyrix 6x86 P200+ is an impressive piece of desktop iron. The minitower is solidly built and has plenty of extra room for adding adapters or drives. The centerpiece is Cyrix's hot new 6x86-P200+ CPU, a processor that derives its name from the clock speed of the Intel processor its performance is closest to.

The Cyrix's industrial-strength configuration includes a CMD 6520W Wide SCSI-2 host adapter with a massive 64MB of on-board cache. This kind of controller helps only those applications that repeatedly load and save huge chunks of data. (Image editing, professional desktop publishing, and large databases are some prime examples.) Typical business applications such as word processing and spreadsheets won't benefit at all.

Except for the monitor, the Cyrix's other components make an impressive multimedia bundle. They include a fast and flexible Matrox MGA Millennium graphics adapter, an eight-speed Mitsumi CD-ROM drive, and a Sound Blaster AWE32 wavetable sound card. The only thing that's missing is a set of speakers.



Cyrix P200+

Documentation is clear, concise, and complete. The Cyrix support package is comprehensive, including a three-year warranty on parts and labor and 24-hour toll-free tech support. Cyrix is fairly new as a PC vendor, so we don't have much feedback on its system reliability and service. But our anonymous tech support calls have been handled quickly, courteously, and most important, accurately.

continued on page 226 ▶

Beyond the Top 20

We tested these systems along with the others, but they didn't score high enough to reach the Top 20 Power Desktops chart. For write-ups, see PC World Online (http://www.pcworld.com/t20pcsnaps).

- **Digital Venturis FX-5133**
- **Everex Pentium Pro 200**
- **HiQ C-200T**
- **Polywell Poly 500IP5**
- **Royal Power Graphic 128**

Not all 800 pound gorillas are what they're cracked up to be.

If you need a scanner that combines high performance and maximum value, may we suggest a little head-to-head competition. UMAX vs HP? Unfair comparison? Maybe for them. UMAX has a reputation for offering advanced, award-winning scanners at prices that make good business sense. Plus, our software bundles are unmatched, even by the big boys. So why monkey around? Compare the UMAX Vista S-12 with the HP ScanJet 4c and decide for yourself.

Compare	UMAX Vista S-12	HP Scanjet 4c
Image editor software	✔ Adobe Photoshop Full	Photopaint
Presentation software	✔ ASAP Word Power	None
Maximum DPI	✔ 9600	2400
Bit depth	✔ 33-bit[1]	30-bit
Scanning speed (5" x 7" color photo)	✔ 18 sec.	42 sec.
Lamp	✔ Cold cathode - lasts longer	Fluorescent
Tech support	✔ Toll free	No 800 number
Price [2]	✔ $821	$ 912

UMAX Vista S-12

HP Scanjet 4c

UMAX

toll free **800-859-2728**

http://www.umax.com

Circle 250 on reader service card

[1] 33-bit equivalent with the analog gamma correction. [2] Average street price from sampled advertisements in Computer Shopper May, 1996.

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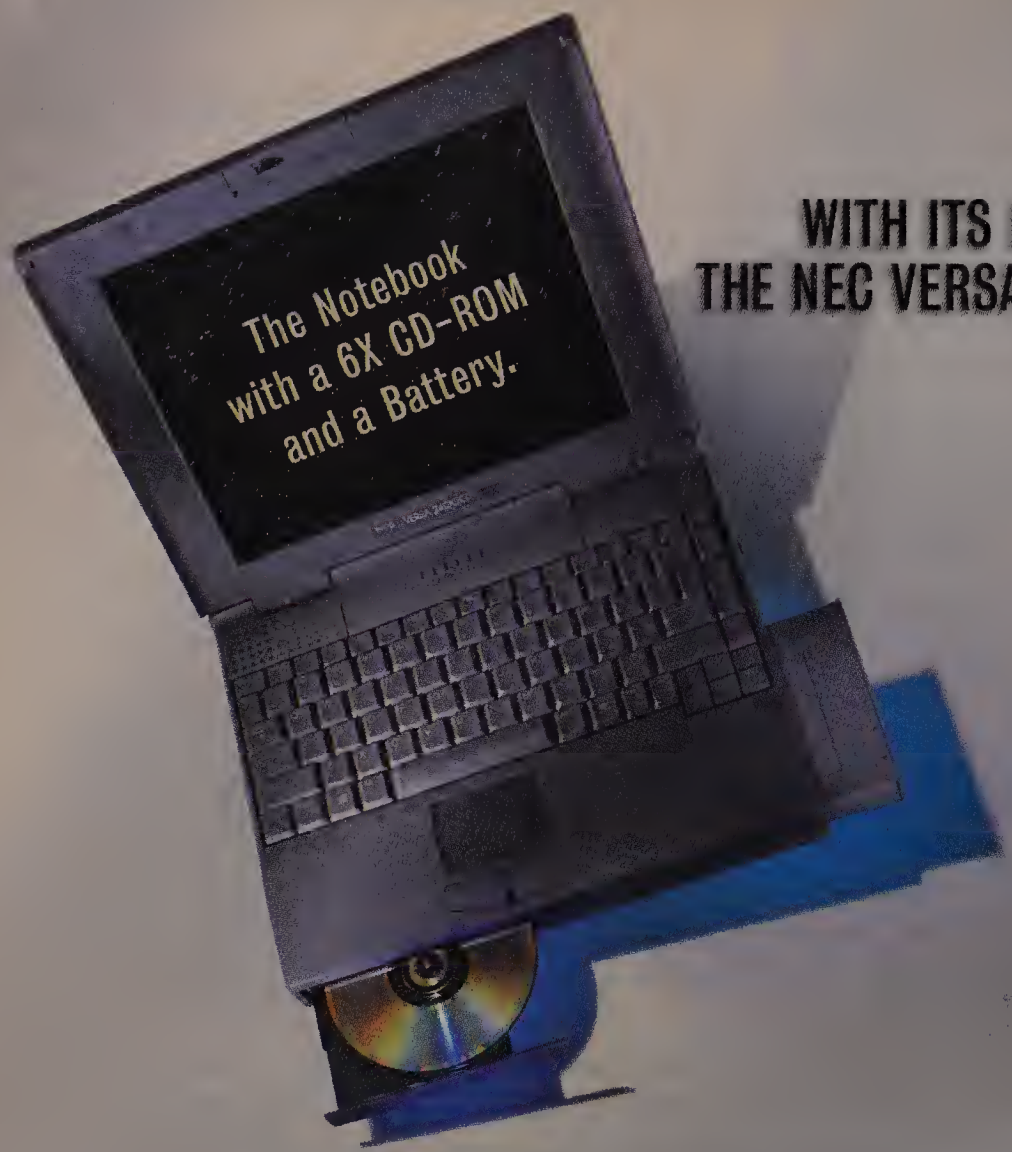

WITH ITS INTERCHANGEABLE COMPONENTS, THE NEC VERSA 2400 IS ACTUALLY 4 NOTEBOOKS IN 1.

Just slip the 6X CD-ROM drive and battery into the two modular VersaBay™ slots, and your NEC Versa® 2400 changes into a state-of-the-art multimedia tool for brilliant on-the-road presentations.

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Up to 1.08GB hard drive

11.3" DSTN color display

*Two VersaBay slots***

Two high-output stereo speakers

Two PC Card slots

MPEG video

SEE, HEAR AND FEEL THE DIFFERENCE.™

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Intel Pentium® Processor up to 133MHz

Up to 16MB EDO DRAM

Up to 1.08GB hard drive

11.3" DSTN color display

*Two VersaBay slots***

Two high-output stereo speakers

Two PC Card slots

MPEG video

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WITH ITS INTERCHANGEABLE COMPONENTS, THE NEC VERSA 2400 IS ACTUALLY 4 NOTEBOOKS IN 1.

Slide the 6X CD-ROM drive and the floppy drive into the two modular VersaBay slots. On AC power, your NEC Versa 2400 transforms into a powerful multimedia notebook that will rival a desktop computer.

*NEC Versa 2400 Series, starting at $2199**

Intel Pentium® Processor up to 133MHz

Up to 16MB EDO DRAM

Up to 1.08GB hard drive

11.3" DSTN color display

*Two VersaBay slots***

Two high-output stereo speakers

Two PC Card slots

MPEG video

SEE, HEAR AND FEEL THE DIFFERENCE.™

NEC

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Circle 203 on reader service card

Adobe PostScript

600 DPI COLOR CAPABLE Vivid color on any office paper or transparency.

5¢ A COLOR PAGE A tiny fraction of what you pay for color photocopies.

FREE BLACK INK Now you can send everything to your color printer. Black text pages cost even less than on a b&w laser.

$3,495 From the leader in laser-class color printers with 14 years in color printing, 50 years of innovation.

6 PPM COLOR Twice as fast as any competitor's desktop laser. Far beyond any inkjet.

Brilliant performance.

The new Phaser® 350 costs less to own, less to use than any other laser-class, workgroup color printer. With all the award-winning performance that's become the hallmark of Tektronix: RISC processing. Ample RAM. PostScript® Level 2. Networkability. So now our incredible

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BANCOM International
Dare bonas artes, maneo, Romana juventus. Non tantum trepidos ut tueara reos; Quam populus judexque gravis lectusque senatus. Non tantum
Phaser 140
Phaser 240
Phaser 440
Phaser 350
Phaser 550
Phaser 480X
Phaser 300X
Breakthrough price.
Power
speed and brilliant color are the most affordable and economical, too. All barriers are down.
Waiting for color is history. No wonder, at over $500 million in color printing revenue,
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Tektronix
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Circle 124 on reader service card

PC WORLD

TOP 20 BUDGET DESKTOPS

	SYSTEMS	Last month	Month tested	Street price (8/14/96)	CPU	Comments
1	Micron P133 Millennia 800/223-6571 www.micron.com	1	Mar 96	$1899	Pentium-133	$150 price drop, great features and speed, improved reliability rating.
2	Dell Dimension P200v 800/613-3355 www.dell.com	–	new	$1999	Pentium-200	Only P-200 on the Budget chart, extremely fast; sound costs extra.
3	Dell OptiPlex GXM 5100 800/613-3355 www.dell.com	2	Aug 96	$2068	Pentium-100	Nicely constructed simple business system with built-in networking; $145 drop.
4	Quantex QP5/120 M-4 800/896-4898 www.quantex.com	–	new	$2249	Pentium-120	Everything you'd want in a home office PC, except a good service rating.
5	Gateway 2000 P5-133 800/846-2000 www.gw2K.com	–	new	$1864	Pentium-133	Very fast, affordable minitower has fine graphics card, but sound is $99 extra.
6	NMC PCW P100 800/800-4662 www.sisna.com/natmicrosys/	–	Aug 96	$1299	Pentium-100	$450 drop makes this a bargain minitower; components are mostly generic.
7	ProGen Discover MPEG II P150 800/848-8777 www.progen.com/	–	new	$1599	Pentium-150	Only P-150 on the chart; low price; it's set up to please game players.
8	Digital Venturis 575 800/722-9332 www.digital.com	11	Mar 96	$1425	Pentium-75	Simple business system now $200 less; good service and reliability ratings.
9	NEC PowerMate V100 800/632-4636 www.nec.com	16	Aug 96	$1963	Pentium-100	Solid value with very good design and features, $267 price drop.
10	Vektron Multimedia P-100 800/725-0026 www.vektron.com	5	Mar 96	$1495	Pentium-100	A Best Buy last month, it now faces stiffer competition.
11	Micro Express MicroFlex-686/P120+ 800/989-9900 www.wpages.com/	9	Aug 96	$1399	Cx6x86-P120+	Bargain-basement price, average speed and features, getting support is iffy.
12	Netis N5133DPS 800/577-7526 www.netistech.com	–	Mar 96	$1770	Pentium-133	Except for the 4X CD-ROM, an impressive configuration for under $1800.
13	Xi P133MTower SP 800/432-0486 www.win.net/xi_comp	14	Mar 96	$1929	Pentium-133	Fast for a P-133, full-size tower has plenty of room for more peripherals.
14	Robotech Cobra XLT P-133 800/255-2215 www.robotechusa.com	12	July 96	$1849	Pentium-133	Fast, inexpensive home PC; spotty documentation and tech support.
15	Royal Computer P133 Triton II 800/486-0008 www.royalcomp.com	–	new	$1695	Pentium-133	Good deal on minitower with fine graphics card, wavetable sound.
16	Acma zPower 166V 800/786-6888 www.acma.com	8	Sept 96	$2095	Pentium-166	Fast multimedia PC, only desktop on the chart with PC Card slots.
17	USA Flex Family Special 800/872-3539 www.usaflex.com	9	July 96	$1999	Pentium-133	Decked-out P-133 includes 8X CD-ROM drive; documentation is sparse.
18	Diamond DT-100 800/989-7253 www.diamondtech.com	20	Mar 96	$1125	Pentium-100	Penny-pincher's delight; monitor's tiny and there's no sound.
19	Austin PowerPlus 133 800/752-1577 www.austindirect.com	19	Mar 96	$1999	Pentium-133	$150 price drop makes this a better value than the PowerPlus 100.
20	HP Vectra Series 4 5/120 800/752-0900 www.hp.com	–	Oct 96	$2284	Pentium-120	$239 price drop boosts bare-bones business PC onto chart.

Best Buy See features chart, page 228; performance chart, page 234. Recommended as home system

[1] To order fax copies of system reviews, call 800/434-4495 from a touch-tone phone and use your credit card. You can order next month's reviews in advance: Power Desktops, Budget Desktops, or Notebook PCs Top 20 charts and capsule reviews ($9.95, available October 30).

YOU WON'T FIND too many major vendors selling P-200s for the price of Dell's basic but fast $1999 Dimension P200v, number two on our Budget Desktops chart. Only two budget PCs we tested this month failed to make the grade. Netis's $2186 C166-PDS offers a lot of raw value; it's faster than some P-200s and has some high-end components. But it's not a great home system: Service hours are short, and documentation is bare-bones. The $2245 MidWest Micro 3D Interactive MPEG comes with a joystick, hardware for full-motion video, and a gaggle of MPEG titles, but a poor company reliability score ruined its Top 20 chances. For more details, visit PC World Online (http://www.pcworld.com/t20pcsnaps).

SCORECARD

Overall rating	Price	Vendor's system reliability	Features and design	PC WorldBench score/ performance	Vendor's service and support	Fax reprint number[1]	Reader service number
90	average	best	outstanding	182/very good	best	3268	631
89	average	best	very good	205/very good	best	3447	632
87	average	best	very good	170/good	best	3409	633
83	expensive	poor	outstanding	187/very good	fair	3448	634
82	average	fair	very good	192/very good	good	3449	635
81	very inexpensive	[2]	good	168/good	[2]	3450	636
80	inexpensive	[2]	very good	183/very good	[2]	3451	637
80	very inexpensive	good	good	100/satisfactory	good	3436	638
79	average	fair	very good	163/good	fair	3413	639
79	inexpensive	[2]	very good	171/good	[2]	3325	640
79	very inexpensive	[2]	good	175/good	[2]	3411	641
78	average	[2]	very good	185/very good	[2]	3452	642
78	average	[2]	very good	193/very good	[2]	3398	643
78	average	[2]	outstanding	189/very good	[2]	3393	644
78	inexpensive	[2]	very good	191/very good	[2]	3453	645
78	average	[2]	outstanding	199/very good	[2]	3429	646
77	average	[2]	very good	181/very good	[2]	3426	647
77	very inexpensive	[2]	good	156/good	[2]	3441	648
77	average	poor	very good	178/very good	[2]	3454	649
76	expensive	best	satisfactory	177/good	fair	3455	650
Scorecard weightings	Price 25 percent	Reliability 25 percent	Features 20 percent	Performance 15 percent	Support 15 percent	All products:	903

[2] Insufficient data.

This Month's Best Buys

NO. 1: MICRON P133 MILLENNIA

PRO: Fast, loaded with useful features

CON: None significant

Like its Pentium-200 sibling at number two on the Power Desktops chart, this Pentium-133 model in Micron's Millennia line of PCs keeps dropping in price. Now at $1899, it holds its place as our number one budget desktop for the second month in a row. It's a fairly good configuration for the money, especially the 2.1GB hard drive—unusually large for a budget PC—and the 8X CD-ROM drive, still not common in most systems costing less than $2500. The Micron's PC WorldBench score of 182 is admirable for a budget desktop.

The interior is laid out well, with the SIMM sockets especially accessible. Micron's on-screen documentation is helpful, with illustrations of basic maintenance tasks.

Micron P133 Millennia

Price drops on other Millennias we've tested keep them in contention. The P166 (reviewed in April) now goes for $2099; the P150 (reviewed in May) sells for $1999. The P120 and P100 (both reviewed in March) cost less than $2000. These prices include 15-inch monitors.

NO. 2: DELL DIMENSION P200V

PRO: Well built, 8X CD-ROM drive

CON: No sound, speakers, or applications

Don't look now, but you can buy a P-200 from a top vendor for under $2000. Dell's new Dimension P200v effectively combines Intel's fastest Pentium processor with an array of inexpensive but good-quality components. The result is a powerful and affordable PC that will handle typical business and home computing tasks with ease. If you want sound and speakers, you'll have to pay an extra $99. And Microsoft Office 95 will run you another $219. But even as configured with 16MB of RAM, a 1.6GB hard drive, and Dell's best 15-inch monitor, this $1999 system easily becomes our first Pentium-200 budget Best Buy.

How does this system differ from the Pentium-200s on our Power Desktops chart? The P200v's emphasis is mostly on economy rather than all-out speed and high-end features.

Dell Dimension

For example, the P200v's graphics controller is built into the motherboard to cut costs. While the integrated Trio64V+ with 2MB of EDO RAM does a fine job handling word processing, spreadsheet work, and even basic multimedia, it's not ideal for more complex graphics applications such as image editing and desktop publishing. The more capable graphics ▶

TOP 20 BUDGET DESKTOPS — STANDARD FEATURES

	SYSTEMS	CPU	RAM (MB)	Secondary cache (K)	Hard drive (GB)	Graphics adapter	Video RAM (MB/type)	Monitor tube/ viewable diagonal (inches)	Screen pitch (mm)	CD-ROM drive speed
1	Micron P133 Millennia*	Pentium-133	16	512	2.1	Diamond Stealth64 Video VRAM	2/VRAM	15/13.6	.28	8X
2	Dell Dimension P200v*	Pentium-200	16	256	1.6	integrated Trio64V+	2/EDO DRAM	15/13.5	.28	8X
3	Dell OptiPlex GXM 5100*	Pentium-100	16	256	1.1	integrated Trio64V+	2/EDO DRAM	15/13.5	.28	4X
4	Quantex QP5/120 M-4*	Pentium-120	32	512	3.1	STB Lightspeed 128	2/MDRAM	17/16	.26	8X
5	Gateway 2000 P5-133*	Pentium-133	16	256	1.6	STB Lightspeed 128	2/MDRAM	15/13.9	.28	8X
6	NMC PCW P100	Pentium-100	16	256	0.9	Vista A64P	2/DRAM	15/13.8	.28	4X
7	ProGen Discover MPEG II P150	Pentium-150	16	512	1.3	ProGen Gold 64V+ PCI	2/EDO DRAM	15/13.7	.28	8X
8	Digital Venturis 575	Pentium-75	8	256	0.9	integrated Trio64	1/DRAM	15/13.5	.28	4X
9	NEC PowerMate V100	Pentium-100	16	256	1.6	Alliance ProMotion 6422	2/DRAM	15/13.5	.28	6X
10	Vektron Multimedia P-100	Pentium-100	16	256	2.1	Diamond Stealth64 Video VRAM	2/DRAM	15/14.1	.25	6X
11	Micro Express MicroFlex-686/P120+	Cx6x86-P120+	16	256	1.3	STB Powergraph 64 Video	2/DRAM	15/14.1	.28	8X
12	Netis N5133DPS	Pentium-133	16	256	1.6	Diamond Stealth64 Video VRAM	2/VRAM	15/14	.28	4X
13	Xi P133MTower SP	Pentium-133	16	512	1.3	Diamond Stealth64 Video VRAM	2/VRAM	17/15.6	.26	6X
14	Robotech Cobra XLT P-133	Pentium-133	16	256	1.3	Number Nine 9FX Motion 331	2/EDO DRAM	17/15.4	.28	6X
15	Royal Computer P133 Triton II	Pentium-133	16	512	1.3	Matrox MGA Millennium	2/WRAM	15/13.9	.28	6X
16	Acma zPower 166V	Pentium-166	16	256	1.3	Diamond Stealth64 Video 2001	2/EDO DRAM	15/13.7	.28	6X
17	USA Flex Family Special	Pentium-133	16	256	1.3	STB Powergraph 64 Video	2/EDO DRAM	15/13.7	.27	8X
18	Diamond DT-100	Pentium-100	16	256	1.3	Paradise Bahamas 64	1/DRAM	14/13.6	.28	8X
19	Austin PowerPlus 133	Pentium-133	16	256	1.3	ATI Winturbo	2/DRAM	15/13.6	.28	6X
20	HP Vectra Series 4 5/120	Pentium-120	16	512	1.3	S3 Trio64 PnP PCI	2/DRAM	15/13.5	.28	–

*Best Buy

cards in the Dimension XPS models and many other power systems make them a better choice for these applications. The 15-inch Dell monitor, while not big enough for graphics professionals, is great for business users because of its crisp Trinitron tube.

The P200v makes other concessions to cut costs, such as using a motherboard with a 256K secondary cache ceiling, as opposed to the larger 512K limit found in the Dimension XPS line. Trade-offs like these contribute to ordinary performance for a P-200. Its PC WorldBench score of 205 is marginally below average for the P-200s we've tested, although it is 6 percent faster than the average P-166 and 15 percent faster than the typical P-133. Considering that the P200v is priced about 5 percent lower than the average Pentium-133 PC in our reviews, you're still getting a lot of speed for your money.

A peek inside this sturdy minitower reveals a clutter-free motherboard with no add-in cards. By integrating the video controller and video memory onto the motherboard and omitting both a sound card and a modem, the Dimension keeps all six expansion slots open. There are also four open drive bays.

Dell throws in a three-year warranty and gives you free Windows 95 support for 30 days, as it does on its more expensive XPS models. The company fields hardware questions around the clock for the life of the system.

Dell OptiPlex

NO. 3: DELL OPTIPLEX GXM 5100

PRO: Fast, well designed, built-in networking

CON: No application software

The $2068 OptiPlex GXM 5100 is aimed at the business buyer who wants built-in networking in a budget-price system. With a PC WorldBench score of 170, it's quite fast for its price and CPU class.

The graphics controller—which can accelerate full-motion video—is integrated onto the motherboard along with a 16-bit sound chip. And this desktop has some room for expansion, including five open slots and one drive bay. Upgrading is a snap, thanks to an easy-open case and clean interior.

		EXPANDABILITY						CUSTOMER SUPPORT			
Modem speed (kbps)	Sound board	Case style	Max. RAM (MB)	Maximum secondary cache (K)	Open RAM sockets	Open drive bays (ext./int.)	Open slots	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
–	Creative Labs Vibra 16	compact	128	512	2	2/1	5	3/1	24	Sat., Sun.	BBS, WWW
–	–	minitower	64	256	1	3/1	6	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	integrated Vibra 16	desktop	128	512	2	1/0	5	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
33.6	Ensoniq Soundscape Vivo	minitower	128	512	2	2/1	4	3/1	15	Sat., Sun.	BBS, Prodigy, WWW
–	–	minitower	128	256	1	2/2	5	3/1	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
28.8	Creative Labs Vibra 16	minitower	128	512	2	2/1	3	3/3	10	–	BBS, WWW
33.6	AudioDrive 32 PnP	minitower	128	512	2	3/2	4	3/1	11	–	BBS
–	–	desktop	128	256	2	1/0	4	3/3	24	Sat., Sun.	AOL, BBS, CIS, WWW
–	integrated OPTi 930A	minitower	128	256	2	2/2	5	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
14.4	Creative Labs Vibra 16	minitower	128	256	2	2/0	5	1/1	11	–	BBS, CIS, WWW
–	ESS ES16B8 Audio Drive	minitower	128	512	4	3/1	6	2/2	9.5	Sat., Sun.	WWW
28.8	Creative Labs Vibra 16	minitower	128	512	2	3/1	4	1/3	10	Sat.	BBS, WWW
–	Creative Labs Vibra 16	tower	128	512	2	5/2	6	3/3	9	Sat.	WWW
28.8	Sound Blaster 16	minitower	128	512	2	3/3	4	3/1	9	–	BBS, WWW
–	Sound Blaster AWE 32 PnP	minitower	512	512	4	3/1	5	1/lifetime	10	Sat.	BBS, WWW
28.8	Sound Blaster 16	minitower	128	512	2	2/1	3	3/1	9.5	–	BBS, WWW
28.8	proprietary 16-bit	minitower	128	512	2	3/1	4	3/3	24	Sat., Sun.	–
–	–	minitower	128	512	2	3/0	4	1/1	9	–	BBS
28.8	integrated 16-bit	minitower	128	512	2	2/2	3	3/3	24	Sat., Sun.	BBS
–	–	desktop	128	512	4	2/0	4	1/1	16	Sat.	AOL, BBS, CIS, WWW

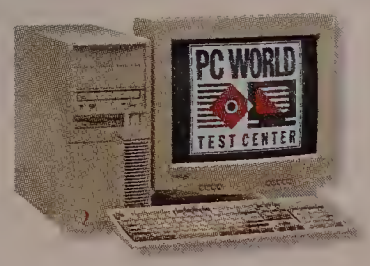
If you're a do-it-yourselfer, you'll like the GXM 5100's documentation, which is detailed, thorough, and easy to read and understand. The strong three-year warranty is paired with company service and reliability that consistently rate very highly with readers responding to our ongoing fax-back polls. About the only thing missing is application software.

NO. 4: QUANTEX QP5/120 M-4

PRO: Good reference software bundle; tons of memory, secondary cache, and storage

CON: Poor reliability rating, cluttered interior

If you're craving a power desktop but just can't afford one, the Quantex QP5/120 M-4 minitower gives you a lot for your dollar—provided you're not too fussy about reliability and service. Our ongoing fax-back reader surveys rate Quantex as poor and fair in those categories.



Quantex QP5/120

Priced at $2249, this Pentium-120 has much of what you find in power systems: very good performance, lots of memory, a big hard drive, and a large monitor. Granted, no Pentium-120 will keep pace with a P-166 or P-200, but the QP5/120 M-4 generated a PC WorldBench score of 187—the fastest of any Pentium-120 we've tested. It's a bit above average for all budget systems, and plenty fast for most home and business users.

Quantex loaded up this system with 32MB of RAM, a 512K secondary cache, and a 3.1GB hard drive, which is huge for a system in the budget price range. The quality of the 17-inch MAG DX1795 monitor is good, and the STB Lightspeed 128 video card with 2MB of MDRAM is ranked near the top of our Top 10 Graphics Boards chart.

Our Quantex also came with a nice selection of extras for communications and multimedia. If you plan to spend time on the Internet, the 33.6-kbps fax-modem will be handy. A good-quality 8X Toshiba XM 5602 EIDE CD-ROM drive spins the discs, while an Ensoniq Soundscape Vivo wavetable sound card puts out the audio. Unfortunately, Quantex cut costs on the external speakers; we would prefer something better than the low-end Altec ▶

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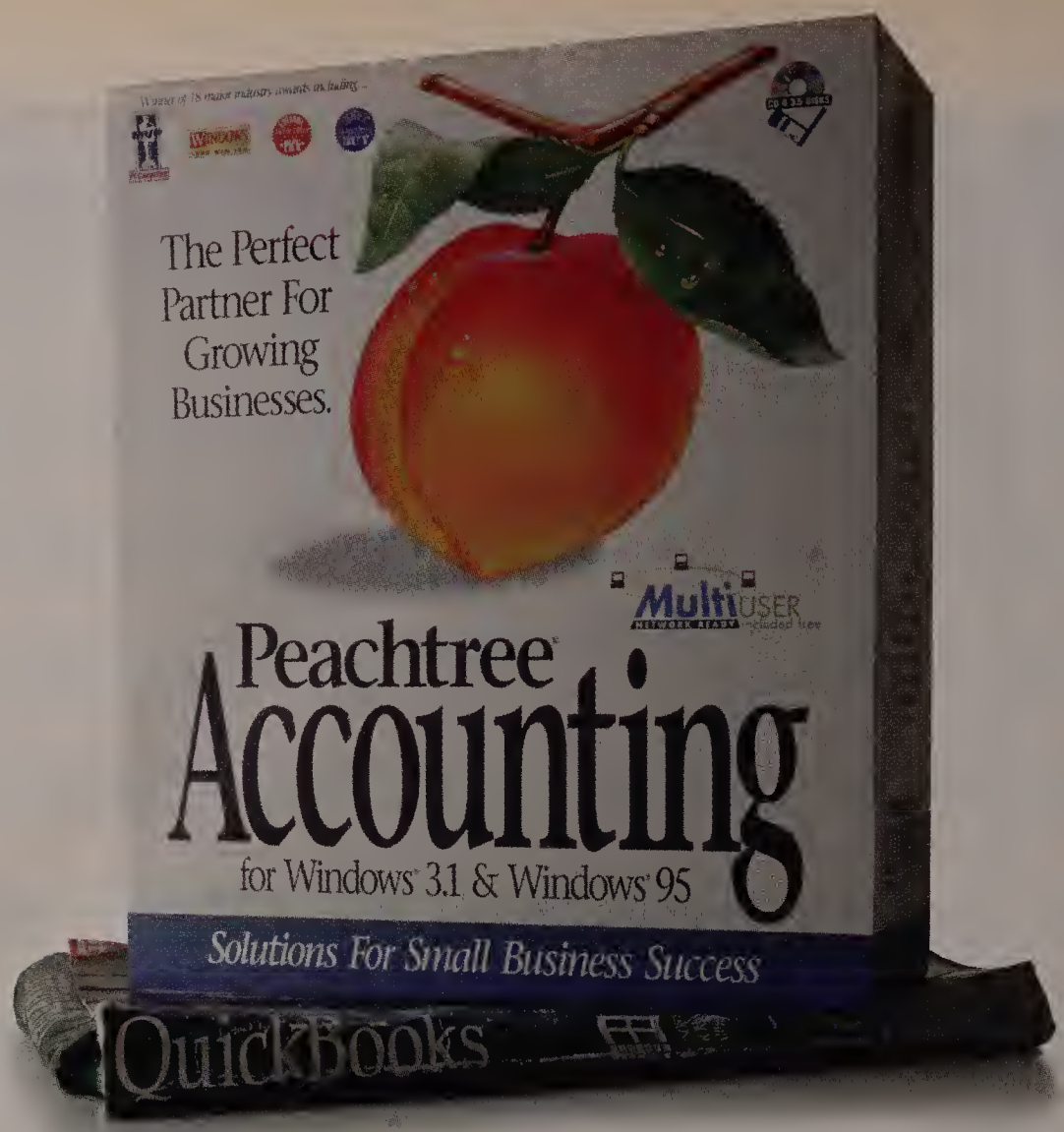

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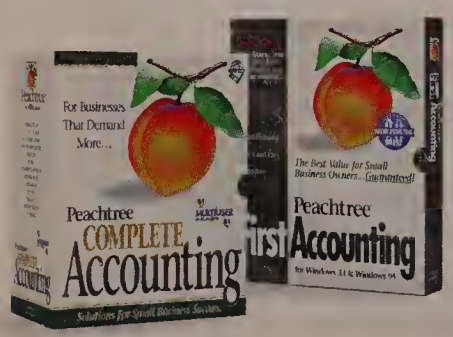

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WWWWW "...an excellent choice" *Windows* Magazine

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Echos P100C

100MHz Pentium processor, 8MB std./40MB max. RAM, 11.3" DSTN display, PCI Bus, 256K L2 cache, 1.3GB removable HDD, 800x600 SVGA resolution, Multi-function bay: 6X CD-ROM and modular FDD (std.), second battery (opt.)

$2,299*

Echos P100E

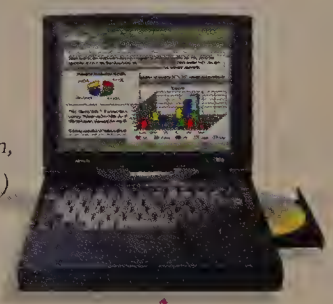
100MHz Pentium processor, 8MB std./40MB max. RAM, 10.4" TFT display, PCI Bus, 256K L2 cache, 1.3GB removable HDD, 800x600 SVGA resolution, Multi-function bay: 6X CD-ROM and modular FDD (std.), second battery (opt.)

$2,799*

Echos P120E

120MHz Pentium processor, 8MB std./40MB max. RAM, 11.3" TFT display, PCI Bus, 256K L2 cache, 1.3GB removable HDD, 800x600 SVGA resolution, Multi-function bay: 6X CD-ROM and modular FDD (std.), second battery (opt.)

$3,599*



Echos P133S

133MHz Pentium processor, 16MB std./40MB max. RAM, 11.8" TFT display, PCI Bus, 256K L2 cache, 1.3GB removable HDD, 800x600 SVGA resolution, Multi-function bay: 6X CD-ROM and modular FDD (std.), second battery (opt.)

$4,599*

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Lansing ACS 45s. You get a nice bundle of software, including Quicken SE, How Your Body Works, Grolier's Encyclopedia 8.0, Mindscape Reference Library, EveryWhere USA East & West, The Animals, and a slew of games. You'll have to buy your own word processor and spreadsheet applications, however.

The Quantex's overall design is adequate. Typical of many systems that we see, the inside of the case is somewhat cluttered. You'll find it hard to add memory without unhooking some cables, and you can't install any full-length ISA cards because the CPU is in the way. The system does have plenty of open expansion slots and drive bays.

The documentation is barely adequate: It's hard to find what you're looking for without a glossary, index, or detailed table of contents to consult. Quantex's service rating from our ongoing fax-back reader survey is fair. You get a year of free on-site service, and toll-free technical support is available 15 hours a day, seven days a week. Although we were still experiencing long waits during calls at press time, the company assures us it's working to improve technical support response times. Moreover, the poor survey rating on Quantex's system reliability is sobering, although the company does provide a three-year limited warranty. ▶

TOP 20 BUDGET DESKTOPS

	SYSTEMS	CPU	RAM (MB)	Secondary cache (K)	PC WorldBench score
1	Micron P133 Millennia*	Pentium-133	16	512	182
2	Dell Dimension P200v*	Pentium-200	16	256	205
3	Dell OptiPlex GXM 5100*	Pentium-100	16	256	170
4	Quantex QP5120 M-4*	Pentium-120	32	512	187
5	Gateway 2000 P5-133*	Pentium-133	16	256	192
6	NMC PCW P100	Pentium-100	16	256	168
7	ProGen Discover MPEG II P150	Pentium-150	16	512	183
8	Digital Venturis 575	Pentium-75	8	256	100
9	NEC PowerMate V100	Pentium-100	16	256	163
10	Vektron Multimedia P-100	Pentium-100	16	256	171
11	Micro Express MicroFlex-686/P120+	Cx6x86-P120+	16	256	175
12	Netis N5133DPS	Pentium-133	16	256	185
13	Xi P133MTower SP	Pentium-133	16	512	193
14	Robotech Cobra XLT P-133	Pentium-133	16	256	189
15	Royal Computer P133 Triton II	Pentium-133	16	512	191
16	Acma zPower 166V	Pentium-166	16	256	199
17	USA Flex Family Special	Pentium-133	16	256	181
18	Diamond DT-100	Pentium-100	16	256	156
19	Austin PowerPlus 133	Pentium-133	16	256	178
20	HP Vectra Series 4 5/120	Pentium-120	16	512	177

*Best Buy

Word 7.0 for Windows 95
Excel 7.0 for Windows 95
Picture Publisher 6.0 for Windows 95
Paradox 5.0 for Windows
WordPerfect 6.1 for Windows
1-2-3 release 5 for Windows

HOW WE TEST All systems are tested with PC WorldBench, PC World's application-based benchmark. A higher PC WorldBench score is better. All PCs have Windows 95, and video resolution is set to 800 by 600 in 256 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC WorldBench score is a sum of the weighted result of each script: Word (25 percent), Excel (20 percent), Picture Publisher (15 percent), Paradox (15 percent), WordPerfect (15 percent), and 1-2-3 (10 percent). For more details on our benchmark and how we run it, see PC World Online (http://www.pcworld.com).

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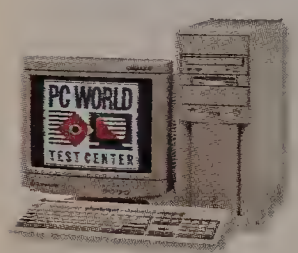
NO. 5: GATEWAY 2000 P5-133

PRO: Fast, great documentation, beautiful design and construction

CON: No modem or sound card at this price, reliability could be better

Gateway 2000's P5-133 features a fresh design, better construction than previous models, and an affordable price—just $1864. The new angular case style has a more up-to-date feel than the curvy Gateways of the past; we found it very attractive. It's also one of the fastest Pentium-133s we've tested, turning in an amazing PC WorldBench score of 192. That's faster than some P-166s we've tested. It's a great business system, but not one that we would recommend for home use unless you add a sound card and speakers—ours came with neither.



Gateway P5-133

The P5-133 we looked at had a 1.6GB hard drive and an eight-speed Toshiba EIDE CD-ROM drive. The 15-inch CrystalScan monitor is a good basic display, but it's not Gateway's top of the line, the more expensive Vivitron. We can't find fault with the 2MB STB Lightspeed 128 graphics adapter, which is currently ranked near the top of our Top 10 Graphics Boards chart. The P5-133's reasonable price also includes Microsoft Office 95 Professional Edition.

The P5-133 offers a cutting-edge feature for a budget system: Memory is supplied in synchronous DRAM DIMMs. SDRAM is the fastest (and most expensive) new type of memory, and DIMMs can be installed in single memory modules rather than in pairs like the more typical SIMMs. The system's construction is sturdy, and its layout is clean. The motherboard is easy to access and upgrade.

Gateway's printed documentation is as professional as it comes. The warranty covers parts for three years and labor for one, and a year of free on-site service is thrown in along with 24-hour-a-day tech support. Gateway earns a good service and support score because of its fine support policies, but our readers still rate system reliability only as fair.

New This Month

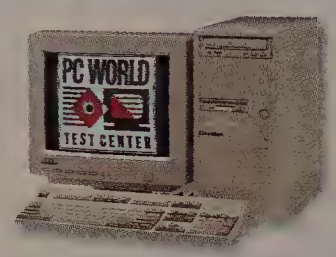
The following PCs made our Budget Desktops chart for the first time this month. For previously tested PCs on the chart, visit our Web page at http://www.pcworld.com/t20pcs.

NO. 7: PROGEN DISCOVER MPEG II P150

PRO: MPEG graphics board, great-sounding speakers, bargain price

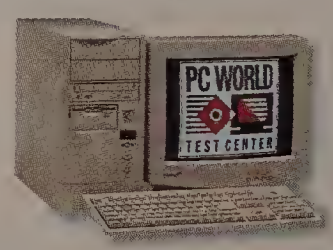
CON: Documentation could be better, no weekend tech support, reliability record is an unknown

This full-featured system is only an average Pentium-150 performer, but it comes with a fast modem and a bargain price of just $1599. The ProGen has the extra multimedia features necessary to make it a good machine for game players, but you'll have to pay extra for an office suite to make it a complete home system.



ProGen Discover

Our ProGen came with a relatively mixed configuration: a Pentium-150 CPU, 16MB of EDO RAM, and 512K of secondary cache—more than we typically see on budget systems. It also had an 8X GoldStar EIDE CD-ROM drive, which was a Best Buy in September (see "CD-ROM Drives: Behind the Ratings"). The ProGen Gold 64V+ PCI video card should handle heavy-duty graphics applications (although we have not tested it for our Top 10 Graphics Boards chart), and it lets you run full-motion MPEG video. On the other hand, it was matched with a fairly plain 15-inch CTX monitor. At 1.3GB, the hard drive is none too large either. Bent on exploring the Web? ProGen throws in a 33.6-kbps fax-modem. The wavetable sound card and speakers are generic, but we liked what we heard. The stereo speakers are powerful and sound good.



Royal P133

This minitower system has plenty of expandability, with four available expansion slots and five open drive bays. The interior is fairly neat, but we still had to push aside a bit of cable tangle to get to the SIMM sockets. And the system's keyboard felt flimsy and cheaply constructed.

ProGen's support policies are adequate. The warranty covers parts for three years and labor for one, with a year of free on-site service. Toll-free tech support is available just 11 hours per day, weekdays only.

NO. 15: ROYAL COMPUTER P133 TRITON II

PRO: Inexpensive, fast multimedia PC

CON: One-year parts warranty at this price, technical support is iffy

If your castle needs a PC that won't bankrupt the court, check out the Royal P133 Triton II, a surprisingly complete system for the money. At $1695, it's one of the least expensive Pentium-133 PCs we've seen. It's also one of the fastest.

This minitower's interior is impressively clean and clutter-free. Ordinarily, that means easy upgrades. But if your PC arrives the way ours did, installing PCI cards will be a Royal pain in the you-know-what. Both PCI slots in our system were blocked by the serial, parallel, game, and mouse ports. You'll have to reinstall these ports where they belong, into cutouts in the case, before you can use the PCI slots. The job takes about a half hour. Otherwise, we liked the way the P133 Triton II was laid out.

Royal throws in some good software to get you going, including Lotus SmartSuite 96 and InfoPedia 2.0, a CD-ROM reference title. Support is a mixed bag. Royal covers labor for a lifetime, but guarantees parts for only a year. Technical support is toll-free but available only 10 hours Monday through Saturday, and it's not very good, at least based on our experience. We had to wait over 24 hours for a return call, and the technician's poor English made communication difficult. ▶

Beyond the Top 20

We tested these systems along with the others, but they didn't score high enough to reach the Top 20 Budget Desktops chart. For write-ups, see PC World Online (http://www.pcworld.com/t20pcsnaps).

- **MidWest Micro 3D Interactive MPEG**
- **Netis C166-PDS**

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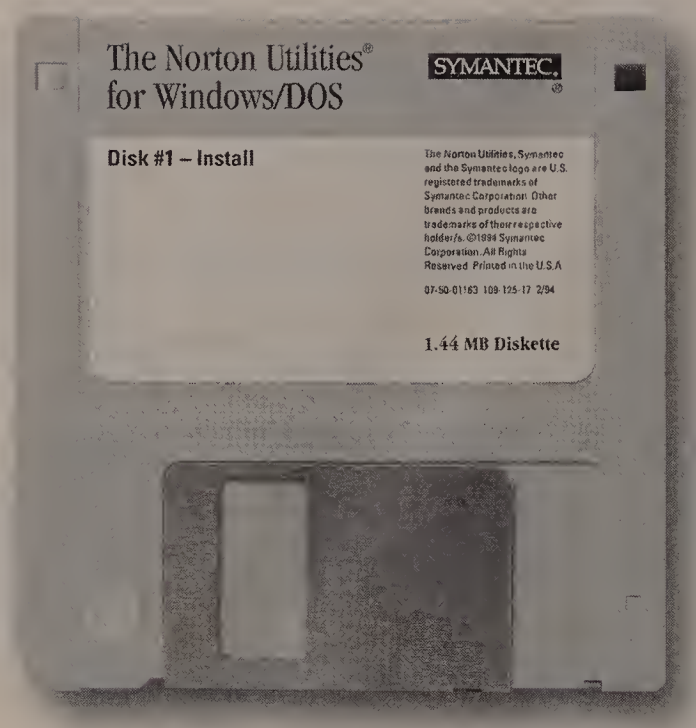

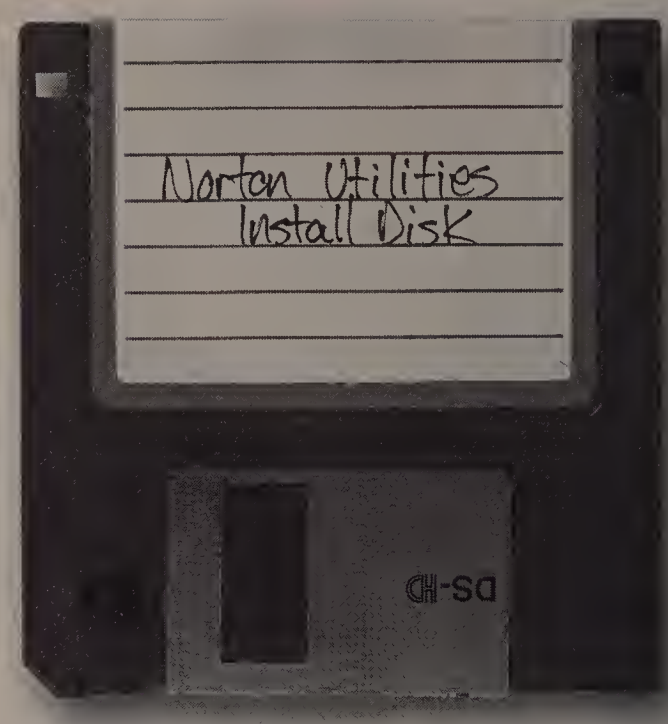

These disks are exactly the same, but somebody just paid $100,000 for the one on the right.

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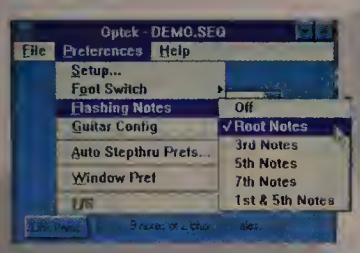

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PC WORLD

TOP 20 NOTEBOOK PCs

	POWER NOTEBOOKS	Last month	Month tested	Street price (8/18/96)	CPU	Comments
1	Dell Latitude LM P133ST 800/613-3355 www.dell.com	1	Oct 96	$3849	Pentium-133	Number one again this month; great speed, fine screen and battery.
2	Gateway 2000 S5-100XL 800/846-2000 www.gw2K.com	6	Oct 96	$3349	Pentium-100	Improved reliability rating on Gateway notebooks makes this a Best Buy.
3	Dell Latitude XPi P133ST 800/613-3355 www.dell.com	2	Aug 96	$4599	Pentium-133	Fast notebook tested with hefty 24MB of RAM; no CD-ROM drive option.
4	WinBook XP5 P120 800/468-2162 www.winbookcorp.com/	7	Apr 96	$2779	Pentium-120	$720 price drop on quick P-120 puts it on Power and Budget charts.
5	IBM ThinkPad 760E 800/772-2227 www.ibm.com	8	Sept 96	$6248	Pentium-133	Great speed and features; pricey, so-so battery life.
6	Toshiba Satellite Pro 420CDS 800/457-7777 www.toshiba.com	3	Sept 96	$2798	Pentium-100	$500 drop helps fairly fast multimedia model make both charts.
7	NEC Versa 6030H 800/632-4636 www.nec.com	–	new	$5799	Pentium-133	Expensive, quick, has a fine screen, 6X CD-ROM drive, and a fast fax-modem.
8	Compaq Armada 4120T 800/345-1518 www.compaq.com	–	new	$4298	Pentium-120	Fairly fast, modular multimedia notebook uses up to three batteries at once.
9	Fujitsu Montego 888/466-8434 www.fujitsu-pc.com	–	new	$3199	Pentium-100	Fujitsu's first notebook is quick and light, long warranty but no CD-ROM drive.
10	Toshiba Tecra 720CDT 800/457-7777 www.toshiba.com	4	Sept 96	$6299	Pentium-133	Chunky and extremely pricey, but killer screen.
	BUDGET NOTEBOOKS					
1	Toshiba Satellite 100CS 800/457-7777 www.toshiba.com	1	June 96	$1599	Pentium-75	Price drop of $200 this month on no-frills Pentium; service rating's down.
2	IBM ThinkPad 365E 800/772-2227 www.ibm.com	–	new	$1799	Cx5x86-100	Inexpensive notebook with Cyrix CPU has great keyboard, P-75-level speed.
3	IBM ThinkPad 560 800/772-2227 www.ibm.com	–	new	$2699	Pentium-100	Lots of RAM, fine keyboard, and dual-scan display, but no internal floppy drive.
4	WinBook XP5 P120 800/468-2162 www.winbookcorp.com/	–	Apr 96	$2779	Pentium-120	$720 price drop; also number four on Power chart.
5	AcerNote Light 356 800/733-2237 www.acer.com	6	Sept 96	$1999	Pentium-100	$200 drop helps light, comfortable P-100 despite its disappointing screen.
6	Toshiba Satellite Pro 420CDS 800/457-7777 www.toshiba.com	–	Sept 96	$2798	Pentium-100	$500 price drop; also number six on Power chart.
7	WinBook XP5-P100 800/468-2162 www.winbookcorp.com/	–	new	$2399	Pentium-100	Quick, good display, fine battery life, reliability rating slightly improved.
8	AcerNote Light 361 800/733-2237 www.acer.com	–	new	$2199	Pentium-120	Nice performance for the money, long warranty; port covers are flimsy.
9	Toshiba Satellite 110CT 800/457-7777 www.toshiba.com	–	new	$2499	Pentium-100	Needs more RAM to be faster but has nice active screen.
10	Digital HiNote VP 800/642-4532 www.digital.com	7	Sept 96	$2499	Pentium-100	Light and well designed, great speed and bright dual-scan screen.

Best Buy See features chart, page 244; performance chart, page 248.

[1] To order fax copies of system reviews, call 800/434-4495 from a touch-tone phone and use your credit card. You can order next month's reviews in advance: Power Desktops, Budget Desktops, or Notebook PCs Top 20 charts and capsule reviews ($9.95, available October 30).

EIGHT NEW NOTEBOOKS, including two budget-price ThinkPads from IBM, stake out positions on this month's notebooks chart. Most agreeable travel companion: Compaq's Armada 4120T, due to the multiple ways you can configure it to balance battery life and function. Chart also-rans you should probably avoid: the new AMS Power CD P100, whose battery kept falling out; the ChemBook 5400A-P/75, a poor attempt at a gaming notebook; and the Echos P100C, Olivetti's failed first try at selling a top-notch notebook in the U.S. For more details, visit PC World Online (http://www.pcworld.com/t20pcsnaps).

SCORECARD

Overall rating	PC WorldBench score	Performance	Price	Vendor's system reliability	Features and design	Vendor's service and support	Battery life (hours:min)/ rating	Traveling weight	Fax reprint number[1]	Reader service number
86	180	outstanding	average	good	very good	good [2]	4:32/good	heavy	3779	651
86	147	very good	average	good	very good	fair [2]	4:46/good	light	3780	652
86	166	very good	average	good	very good	good [2]	5:20/very good	average	3771	653
83	145	very good	inexpensive	fair	good	poor	6:19/outstanding	average	3736	654
83	177	outstanding	very expensive	good	very good	good	2:02/satisfactory	average	3773	–
83	142	good	inexpensive	good	good	fair	4:02/good	heavy	3771	655
82	174	outstanding	very expensive	good	very good	fair [2]	3:04/good	heavy	3785	656
81	143	good	average	good	good	good	4:27/good	very heavy	3786	657
80	136	good	inexpensive	[3]	good	[3]	4:56/very good	light	3787	658
80	160	very good	very expensive	good	outstanding	fair	4:23/good	very heavy	3772	659
Scorecard weightings		Performance 22 percent	Price 14 percent	Reliability 22 percent	Features 16 percent	Support 10 percent	Battery life 8 percent	Weight 8 percent		
81	86	good	very inexpensive	good	satisfactory	fair	3:35/good	average	3754	660
80	82	satisfactory	inexpensive	good	satisfactory	good	4:16/good	light	3788	–
79	135	very good	expensive	good	good	good	3:35/good	very light	3789	–
77	145	outstanding	very expensive	fair	good	poor	6:19/outstanding	average	3736	654
77	118	good	average	[3]	good	[3]	2:57/good	light	3777	661
77	142	outstanding	very expensive	good	good	fair	4:02/good	heavy	3771	655
77	132	very good	average	fair	good	poor	5:02/very good	average	3790	662
76	124	very good	average	[3]	good	[3]	4:16/good	light	3791	663
76	98	good	expensive	good	good	fair	3:35/good	average	3792	664
75	139	very good	expensive	[3]	good	[3]	3:36/good	light	3776	665
Scorecard weightings		Performance 14 percent	Price 22 percent	Reliability 22 percent	Features 16 percent	Support 10 percent	Battery life 8 percent	Weight 8 percent	All products:	914

[2] Limited data; score is based on responses for this company and average of all companies.
[3] Insufficient data.

POWER NOTEBOOKS

This Month's Best Buys

NO. 1: DELL LATITUDE LM P133ST

PRO: Large, crisp screen; terrifically fast

CON: None significant

Number one for the second month in a row, the Dell Latitude LM P133ST is a hands-down Best Buy for users looking for a desktop replacement. This $3849 Pentium-133 notebook scored an amazing 180 on our PC WorldBench test—smack-dab in the middle of performance results for P-133 *desktops*. The 12.1-inch active-matrix color screen is vivid and spacious, with a viewable area close to what you get with a standard 14-inch desktop monitor.

Dell Latitude LM

In our test, the Dell managed to wring 4.5 hours per charge out of its lithium ion battery. The traveling weight of 8.8 pounds, while heavy, isn't bad for a multimedia notebook: As with most ▶

TOP 20 NOTEBOOK PCs — STANDARD FEATURES

	POWER NOTEBOOKS	CPU	Traveling weight (pounds)[1]	RAM (MB)	Hard drive (MB)	Color screen type	Screen diagonal (inches)	Screen resolution	Maximum screen colors	Battery type	Pointing device
1	Dell Latitude LM P133ST*	Pentium-133	8.8	16	810	active	12.1	800 x 600	256	lithium ion	touchpad
2	Gateway 2000 S5-100XL*	Pentium-100	6.8	16	810	active	11.3	800 x 600	256	lithium ion	touchpad
3	Dell Latitude XPi P133ST	Pentium-133	7.2	24	1215	active	11.3	800 x 600	256	lithium ion	trackball
4	WinBook XP5 P120	Pentium-120	7.4	16	1295	active	10.3	640 x 480	65,536	lithium ion	eraserhead, touchpad
5	IBM ThinkPad 760E	Pentium-133	7.8	24	1080	active	12.1	800 x 600	65,536	lithium ion	eraserhead
6	Toshiba Satellite Pro 420 CDS	Pentium-100	8.8	16	772	dual-scan	11.3	800 x 600	65,536	lithium ion	eraserhead
7	NEC Versa 6030H	Pentium-133	8.6	16	1358	active	12.1	800 x 600	65,536	lithium ion	touchpad
8	Compaq Armada 4120T	Pentium-120	10.8	16	814	active	11.8	800 x 600	65,536	lithium ion	touchpad
9	Fujitsu Montego	Pentium-100	6.4	16	1083	active	10.4	800 x 600	256	lithium ion	eraserhead
10	Toshiba Tecra 720CDT	Pentium-133	10.6	16	1130	active	12.1	1024 x 768	16.8 million	lithium ion	eraserhead
	BUDGET NOTEBOOKS										
1	Toshiba Satellite 100CS*	Pentium-75	7.6	8	540	dual-scan	10.4	640 x 480	256	NiMH	eraserhead
2	IBM ThinkPad 365E*	Cx5x86-100	7	8	540	dual-scan	10.4	640 x 480	65,536	NiMH	eraserhead
3	IBM ThinkPad 560	Pentium-100	5.8	16	810	dual-scan	11.3	800 x 600	256	lithium ion	eraserhead
4	WinBook XP5 P120	Pentium-120	7.4	16	1295	active	10.3	640 x 480	65,536	lithium ion	eraserhead, touchpad
5	AcerNote Light 356	Pentium-100	6.8	16	810	dual-scan	10.4	640 x 480	65,536	NiMH	touchpad
6	Toshiba Satellite Pro 420 CDS	Pentium-100	8.8	16	772	dual-scan	11.3	800 x 600	65,536	lithium ion	eraserhead
7	WinBook XP5-P100	Pentium-100	7.4	16	543	dual-scan	10.4	640 x 480	256	NiMH	eraserhead
8	AcerNote Light 361	Pentium-120	6.8	16	810	dual-scan	10.4	640 x 480	65,536	NiMH	touchpad
9	Toshiba Satellite 110CT	Pentium-100	7.4	8	814	active	11.3	800 x 600	65,536	NiMH	eraserhead
10	Digital HiNote VP	Pentium-100	6.8	16	810	dual-scan	10.4	800 x 600	256	NiMH	touchpad

*Best Buy ● Yes ○ No [1] Includes computer, adapter, power cord, floppy drive, and CD-ROM drive if notebook has one.

genuine power notes these days, the unit comes with both a floppy drive and a CD-ROM drive you can swap in and out.

The Latitude's design is classy and uncluttered, and the unit is sturdy. The keyboard is well laid out, with large, full-travel keys. The only compromise is the <F1> through <F12> function keys, which are whittled down to about half the size of the other keys. The touchpad is smooth and responsive, allowing you to click with either the buttons or the touchpad itself. Dell's service and reliability are good according to our reader fax-back surveys, and the support policies are generous. The documentation, both on-screen and printed, is thorough and well written.

NO. 2: GATEWAY 2000 S5-100XL

PRO: Very good performance, good battery life, lightweight and easily portable

CON: Highest-price P-100 on our chart

The Gateway 2000 S5-100XL is a classy power notebook with a fine keyboard, a good pointing device, and performance to spare.

The S5-100XL is pricey for its CPU class. At $3349, it's the most expensive P-100 on our list, but it's well worth the cost. For one thing, the 11.3-inch active-matrix screen is big and clear, with a handy slider for fine-tuning the brightness. The integrated stereo speakers are placed in the display panel near the screen hinge, where they can most effectively project sound. Ports have a sliding door, which is much less likely to break than a hinged cover. The S5-100XL is light (with a traveling weight of 6.8 pounds) and has good battery life (4.8 hours).

Gateway 2000

Typical of Gateway, the documention is good. But the one-year labor warranty is short for this price, and the turnaround policy of 14 days on factory repairs seems particularly long when on-site service is not even an option. Readers rate the company's service and support as only fair.

		EXPANDABILITY					CUSTOMER SUPPORT			
CD-ROM drive speed	Modem speed (kbps)	Maximum RAM (MB)	Modular expansion bays	Bay for second battery	Optional docking station	Infrared port	Warranty for parts/labor (years)	Weekday toll-free support (hours)	Weekend support	Online support
6X	–	40	1	○	●	●	3/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
4X	–	40	0	○	○	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	–	40	0	○	●	●	3/1	24	Sat., Sun.	AOL, BBS, CIS, WWW
–	14.4	32	0	●	●	●	1/1	13	Sat.	BBS
–	28.8	80	1	●	●	●	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
6X	–	40	1	○	●	●	3/3	24	Sat., Sun.	BBS, CIS, MSN, WWW
6X	28.8	48	1	●	●	●	3/3	24	Sat., Sun.	AOL, BBS, CIS, MSN, WWW
4X	–	48	1	●	●	●	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	–	40	0	●	○	●	3/3	24	Sat., Sun.	–
6X	28.8	144	1	○	●	●	3/3	24	Sat., Sun.	BBS, CIS, MSN, WWW
–	–	40	0	○	●	○	1/1	24	Sat., Sun.	BBS, CIS, MSN, WWW
–	–	24	0	○	○	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	–	24	0	○	○	●	1/1	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	14.4	32	0	●	●	●	1/1	13	Sat.	BBS
–	–	40	0	○	○	○	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
6X	–	40	1	○	●	●	3/3	24	Sat., Sun.	BBS, CIS, MSN, WWW
–	28.8	32	0	○	●	○	1/1	13	Sat.	BBS
–	–	40	0	○	○	○	3/3	24	Sat., Sun.	AOL, BBS, CIS, Prodigy, WWW
–	–	40	0	○	●	○	1/1	24	Sat., Sun.	BBS, CIS, MSN, WWW
–	–	40	1	●	●	○	1/1	14	–	AOL, BBS, CIS, WWW

New This Month

The following PCs made our Power Notebooks chart for the first time this month. For previously tested PCs on the chart, visit our Web page at http://www.pcworld.com/t20pcs.

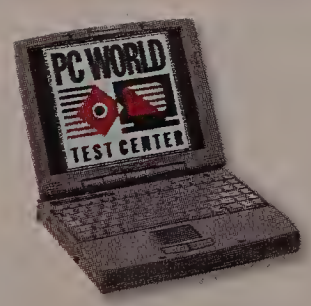
NO. 7: NEC VERSA 6030H

PRO: Fast, well built, multimedia hardware

CON: Very expensive, fair service rating

The NEC Versa 6030H is fast and loaded, but you'd better have deep pockets, because at $5799, it's one of the most expensive portables on our Power chart. Fortunately, it's also the third-fastest notebook we've tested, making it almost as fast as the average Pentium-133 desktop.

Aside from the high price, a couple of other factors keep the Versa 6030H from placing higher on the chart: The 3-hour battery life, while above average, is still the second shortest among our top power notebooks, and readers rate NEC's service and support as only fair.



NEC Versa

The Versa 6030H is well constructed, with sleek lines and a roomy, comfortable keyboard. But the doors that protect the system's ports are flimsy, a trait we've noticed in most Versa notebooks.

The company bundles a few useful software utilities, including FaxWorks, LapLink remote control software, McAfee VirusScan, and Netscape Navigator. The Versa 6030H also has the video hardware it needs to play full-screen, full-motion video clips. NEC even throws in a software MPEG player so you can enjoy full-motion MPEG CD-ROM titles.

NO. 8: COMPAQ ARMADA 4120T

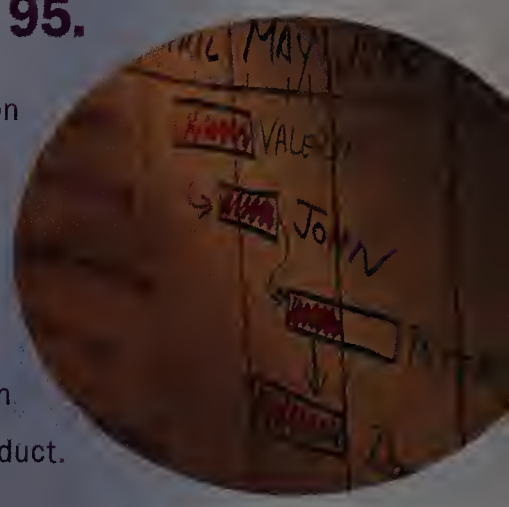
PRO: Highly configurable, lightweight docking station, holds three batteries at once

CON: Heavy when fully configured

Compaq's new Armada 4120T is a Transformer toy for adults. You'll get a kick out of adding, detaching, and moving ▶

to guide
your project down a clear path

Microsoft Project for Windows 95.



Now you can manage projects more simply, more smoothly, by communicating project information as it occurs. With Microsoft® Project you can convey project status quickly and effectively so your boss, customers, and coworkers are always in the loop. From sharing task deadlines and responsibilities, to letting people know about changes and the impact they'll have on the deadline, you have the tools to organize your projects into manageable steps and keep them moving in the right direction. Microsoft Project unlocks the doors of communication and gives you the power to navigate the most efficient route to a successful end product.

Graphical views let teammates visualize where the project is going.

With Microsoft Project you can display project data in ways that everyone can understand. Great-looking Gantt Charts integrate text, timelines and graphical bars so everyone can see start and finish dates, interdependencies and task assignments. Throughout your project, you can also use a Monthly Calendar report to share your plan in a format that's clear and easy to read. And since Microsoft Project shares many of the same key commands with other Office applications, it will be easy to create schedules and reports. But if at any time you need help, type in a question and the Answer Wizard gives you the information you need. Microsoft Project helps you illustrate every phase of your project so you and your team keep your goals in sight.

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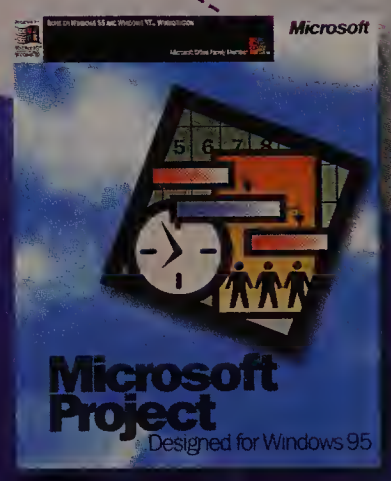
Microsoft Project is completely integrated with a wide range of e-mail systems* and Schedule+ so that with a single click, changes and additions are immediately distributed to and from teammates. Assignments, task changes, and progress can be communicated and updated without ever reentering information, so you save time and eliminate mistakes. And because Microsoft Project is a member of the Office family, sharing data between programs is easy. For example, you can start building a schedule by simply dragging a task list out of Microsoft Excel and dropping it directly into your Microsoft Project plan. You keep communication clear and information consistent and your project continues to move exactly the way you planned.



Now you can take full advantage of Windows 95.

Microsoft Project is the world's best selling project management software and now is optimized to work hand-in-hand with the 32-bit performance, advanced multitasking, and simplified user interface of the Windows® 95 operating system. Together, they help open the lines of communication. Together, they help you enhance the way you manage your projects.

around all its parts to build whatever kind of notebook you want. In its most basic configuration, this 120-MHz version in Compaq's new line of "flexible" portables is a 1.5-inch-deep, 5-pound wafer that can run 4.5 hours on a single battery. Add a seemingly endless combination of batteries, drives, and attachments, and you can work your way up to a 10.8-pound multimedia notebook that runs for 10 hours, according to Compaq. As a performer, the 4120T's speed is barely above average, and at $4298, it has a typical high-end notebook price. But it's a handsome little charcoal-colored number with lots of possibilities.

Compaq Armada

We reviewed a fully configured Armada, including the base notebook, handle, and what Compaq calls the Mobile CD Expansion Unit, a lightweight snap-on base that adds a CD-ROM drive. The most unusual part of the Armada is the adjustable grooved handle. This James Bond–inspired accessory can serve not only as a grip, port cover, and ergonomic keyboard tilt, but also as a compartment for a ▶

TOP 20 NOTEBOOK PCs

	POWER NOTEBOOKS	CPU	RAM (MB)	Secondary cache (K)	PC WorldBench score
1	Dell Latitude LM P133ST*	Pentium-133	16	256	180
2	Gateway 2000 S5-100XL*	Pentium-100	16	256	147
3	Dell Latitude XPi P133ST	Pentium-133	24	256	166
4	WinBook XP5 P120	Pentium-120	16	256	145
5	IBM ThinkPad 760E	Pentium-133	24	256	177
6	Toshiba Satellite Pro 420 CDS	Pentium-100	16	–	142
7	NEC Versa 6030H	Pentium-133	16	256	174
8	Compaq Armada 4120T	Pentium-120	16	256	143
9	Fujitsu Montego	Pentium-100	16	–	136
10	Toshiba Tecra 720CDT	Pentium-133	16	256	160
	BUDGET NOTEBOOKS				
1	Toshiba Satellite 100CS*	Pentium-75	8	–	86
2	IBM ThinkPad 365E*	Cx5x86-100	8	–	82
3	IBM ThinkPad 560	Pentium-100	16	–	135
4	WinBook XP5 P120	Pentium-120	16	256	145
5	AcerNote Light 356	Pentium-100	16	–	118
6	Toshiba Satellite Pro 420 CDS	Pentium-100	16	–	142
7	WinBook XP5-P100	Pentium-100	16	256	132
8	AcerNote Light 361	Pentium-120	16	–	124
9	Toshiba Satellite 110CT	Pentium-100	8	–	98
10	Digital HiNote VP	Pentium-100	16	–	139

*Best Buy

PERFORMANCE

Word 7.0 for Windows 95
Excel 7.0 for Windows 95
Picture Publisher 6.0 for Windows 95
Paradox 5.0 for Windows
WordPerfect 6.1 for Windows
1-2-3 release 5 for Windows

HOW WE TEST All systems are tested with PC WorldBench, PC World's application-based benchmark. A higher PC WorldBench score is better. All PCs have Windows 95, and video resolution is set to 800 by 600 in 256 colors. We run automated scripts on six popular business applications, performing common tasks such as spelling checks, scrolls, saves, sorts, and recalculations. The PC WorldBench score is a sum of the weighted result of each script: Word (25 percent), Excel (20 percent), Picture Publisher (15 percent), Paradox (15 percent), WordPerfect (15 percent), and 1-2-3 (10 percent). For more details on our benchmark and how we run it, see PC World Online (http://www.pcworld.com).

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This is what *PC Magazine* said when they took a look at our program. "A three year warranty on both parts and labor, with on-site replacement the first year, the best warranty we've come across."**

But that's not the only place we make the competition look bad. Let's take a look at viewable image size. Our S17 provides a full 16" of viewable image size and also features a sharper dot pitch than Samsung, NEC and Nokia. And with our high refresh rates, the result is one of the sharpest images available.

That's why *PC World* named the S17 its **Best Buy** for 17" monitors.*** And if it's multimedia you're looking for, check out our PanaMedia™ Series. They feature all the advantages of the S17 with built in stereo speakers and microphone.

Model	Dot Pitch (mm)	Max. Res. (H x V)	H-Scan (kHz/NI)	Viewable Area	Warranty (Years)	ARP*
PanaSync S17	0.27	1280x1024	30-69	16.0"	3/1 Swap	$650
NECXV17+	0.28	1280x1024	31-82	15.6"	3	$799
Samsung 17GLi	0.28	1280x1024	30-65	15.75"	3	$645
Nokia 447L	0.28	1024x768	31-64	15.63"	3	$674

The S17 is just one of Panasonic's complete line of 15" through 21" monitors that are far better than the competition.

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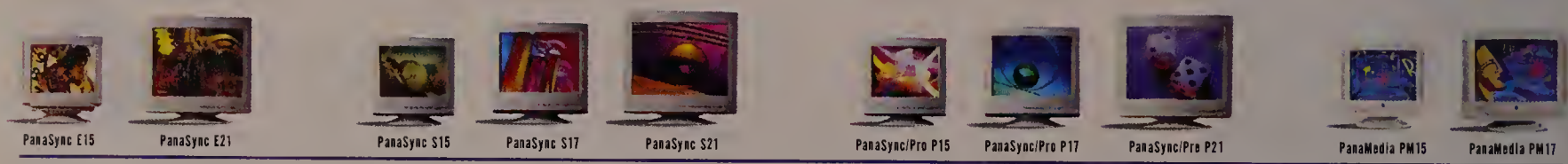

ENTRY SERIES | STANDARD SERIES | PROFESSIONAL SERIES | MULTIMEDIA SERIES

*Average retail price for all competitive models provided by ARS, Inc. as of July 31,1996. **September 1995 ***September 1996
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- 8X CD-ROM drive
- PCI 64-bit Graphics Accelerator w/2MB
- 2.5Gigabyte EIDE Hard Drive
- 3.5-inch Floppy Disk Drive
- MS Mouse and MS Keyboard
- MS Windows NT Workstation 4.0
- 2-Yr. Ltd. Wrnty. w/On Site Option

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Circle 84 on reader service card

second battery. The Armada's expansion unit is the second-most innovative aspect about it. If you want to equip yourself with hardware for a multimedia presentation, or take your notebook out for the day and not worry about plugging it in, just snap this final piece of the puzzle into place. It adds another pair of speakers and can simultaneously hold a third battery and a 4X CD-ROM drive, so you don't have to settle for one or the other.

All notebooks in Compaq's Armada 4100 line come with a nice range of business and leisure software, including ESS Audio Rack, JustConnect, LapLink, Netscape Navigator, and a few games.

NO. 9: FUJITSU MONTEGO

PRO: Fairly fast, stylish, light, compact

CON: Not enough data to gauge reliability and service, no CD-ROM drive option

There are few compromises with this system: The $3199 Fujitsu Montego is fairly fast, light, and compact, and it has a long-lasting battery. It packs a performance wallop for a Pentium-100, and it comes with a couple of nice applications, Quicken and Lotus SmartSuite. In a nutshell, this is a good notebook for computing on the road. Our main reservation is that Fujitsu has had no time to establish a track record on reliability and service.

Fujitsu

Fujitsu cut few design corners in creating its first notebook. The floppy drive is built-in, which is unusual for a notebook this small. The case is stylish and rugged, and the keyboard is comfortable to use. The downsides: The screen looks good, but at 10.4 inches it's on the small side. And at this price, no modem comes bundled or built-in. Another thing missing is an internal CD-ROM drive option. CD-ROM users will have to look at other notebooks.

Fujitsu supplies well-written and comprehensive documentation with the Montego, as well as a three-year warranty and round-the-clock technical support.

BUDGET NOTEBOOKS

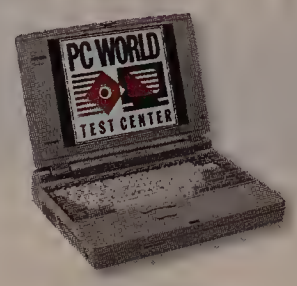
This Month's Best Buys

NO. 1: TOSHIBA SATELLITE 100CS

PRO: Good value, nice screen and keyboard, vendor is noted for system reliability

CON: No bundled application software

The $1599 Toshiba Satellite 100CS is a perfect first notebook—reliable, very inexpensive, and easy to use. This basic Pentium-75 portable doesn't have any of the extras you'll find on more expensive notebooks, such as a super-VGA screen, built-in sound, or even an infrared port, but it's well constructed and comes from one of the most reputable notebook vendors in the business.



Toshiba Satellite

The 100CS has a bright 10.4-inch dual-scan display. The keyboard is comfortable and responsive. It's not a particularly impressive performer, but it's fast for a notebook in this price range.

Toshiba doesn't bundle any application software with the 100CS, but you'll find several helpful utilities to get you acquainted with your machine. The printed manuals are well illustrated. An on-screen program monitors battery life, which topped out at around 3.5 hours.

NO. 2: IBM THINKPAD 365E

PRO: Exceptional keyboard, above-average battery life, bundled Lotus SmartSuite 96

CON: No wrist rest, no sound, small hard drive

One of the best things to come out of IBM's acquisition of Lotus is that you can get a good set of programs like Lotus's SmartSuite 96 in a low-cost entry-level notebook like the $1799 ThinkPad 365E. The notebook itself isn't bad either, although it's not quite as fast as the number one Toshiba Satellite 100CS.

IBM ThinkPad 365E

It's hard to do better than the ThinkPad's keyboard—it's roomy and well designed, with full-size <Shift> and <Enter> keys and a set of dedicated function keys. The bouncy action gives it a nice, responsive feel. Best of all, the keyboard lifts out of the way easily so you can upgrade the memory or replace the battery. At a traveling weight of 7 pounds, the ThinkPad 365E is light, and its 4.3-hour battery life is especially good for a low-end portable. The 10.4-inch dual-scan screen looks bright and clear.

Like the top-ranked Toshiba Satellite 100CS, the ThinkPad 365E has a small 540MB hard drive, which helps keep the price of the notebook down. It also lacks built-in audio.

The ThinkPad 365E comes with an easy-to-follow manual. IBM backs this notebook with a standard warranty of only one year, but technical support is toll-free and available around the clock.

New This Month

The following PCs made our Budget Notebooks chart for the first time this month. For previously tested PCs on the chart, visit our Web page at http://www.pcworld.com/t20pcs.

NO. 3: IBM THINKPAD 560

PRO: Very light, small, fast; good dual-scan screen

CON: LCD panel could be stronger

The $2699 IBM ThinkPad 560 almost has it all: good battery life, sharp screen, comfortable keyboard, nice documentation, great sound, and petite dimensions. It's fast for a budget portable, and it even has features typically found only in higher-end power notebooks—a lithium ion battery, for example. The display is so good you'll have a hard time telling the difference between this and an active-matrix screen.

IBM ThinkPad 560

Our gripes: The extremely thin screen flexes too much. And like most super-small notebooks (it's only 1.3 inches thick), the 560 does not have a built-in floppy drive. Readers give IBM good marks for system reliability as well as service and support. ▶

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NO. 7: WINBOOK XP5-P100

PRO: Nice screen, 28.8-kbps modem

CON: No sound card, small hard drive, questionable reliability

The $2399 WinBook XP5-P100 is a good value, thanks to a couple of perks you won't usually find in a notebook in this price range: 16MB of RAM, which helps make it fast, and a 28.8-kbps PC Card modem. This 7.4-pound WinBook is highly mobile, with a slim profile and a battery life of 5-plus hours. The keyboard has a snappy, comfortable feel, although the tiny <Shift> key could cause a problem for speedy typists. The 10.4-inch dual-scan screen is clean and crisp. The whole package feels sturdy and well built, unlike some notebooks that seem to bend and flex under strain.

WinBook

In a couple of areas we noticed some corners had been cut. The 543MB hard drive is skimpy by today's standards, and while the WinBook comes with stereo speakers mounted on the display panel, you'll have to pay extra if you want a 16-bit sound controller.

The system comes with a helpful manual, but the standard warranty is for just one year. Our experience with WinBook's tech support staff has been good, but readers responding to our fax-back survey have been far less than enthusiastic about WinBook's service or reliability.

NO. 8: ACERNOTE LIGHT 361

PRO: Great price for a P-120, light, good keyboard

CON: Sluggish for its CPU class, poor screen

At $2199, the AcerNote Light 361 notebook is a hot ticket. It's light and has long battery life. Its PC WorldBench score of 124 is low for a Pentium-120 portable with 16MB of RAM, but good for a notebook priced this cheaply. Overall, this notebook is a pretty good budget value.

AcerNote

The portability of the AcerNote Light is a plus: With a battery life of 4.3 hours and a traveling weight of 6.8 pounds, this system is perfect for long trips. The ergonomics are good: The system's keyboard has great full-travel keys, and the <Shift> and <Enter> keys are large, so you're less likely to mistype. The built-in 16-bit audio is a nice touch for a budget notebook, and the sound is quite good.

You do have to be willing to put up with some compromises. We didn't like the case design; it felt overly flexible. And the 10.4-inch dual-scan screen is dull and supports only 640 by 480 resolution. Furthermore, the touchpad pointing device is small and difficult to manipulate, and there's no CD-ROM drive option.

The AcerNote's three-year warranty is a pleasant surprise. Many low-end notebooks have only a one-year warranty. Acer also includes next-business-day replacement for one year, and toll-free tech support around the clock. And the AcerNote Light comes with some useful applications, including Sidekick 95 and Quicken SE 96. We lack sufficient feedback to rate Acer's system reliability and service.

NO. 9: TOSHIBA SATELLITE 110CT

PRO: Sturdy, good screen, built-in AC adapter

CON: No sound, slow for its CPU class, no bundled applications

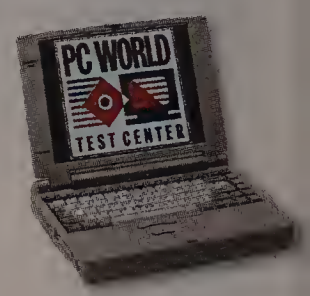
The Toshiba Satellite 110CT is a stylish, well-designed entry-level Pentium for buyers who want an active-matrix display. But the 110CT needs more RAM to perform as fast as most Pentium-100s. With 8MB of RAM and no secondary cache, our test notebook earned a PC WorldBench score of just 98. The average score for P-100 notebooks we've tested with twice as much RAM is 131, about 35 percent faster. That suggests that the extra $299 you'll pay for an 8MB upgrade module will be money well spent.

Overall, the $2499 Satellite 110CT is a good value, especially if you want a top-notch display. Its 11.3-inch active-matrix screen is bright and crisp, and can be viewed from a wider range of angles than a dual-scan. It also supports 800 by 600 resolution and 65,536 colors. If you don't need an active-matrix screen, you can save $500 by buying the dual-scan, 256-color version of the notebook.

Like all Satellites we've tested, the 110CT is sturdy, with a strong latch and well-protected PC Card slots. The keyboard has a nice, responsive feel, and the eraserhead pointing device is easy to use. One of the best features of the Satellite line continues to be its built-in AC adapter, which means all you carry with you on the road is a power cord.

Toshiba cut costs on the 110CT by not supplying any multimedia equipment; there is no 16-bit sound nor an internal CD-ROM drive option. Also, Toshiba does not include any application software. The notebook uses a NiMH battery but still runs for a good 3.5 hours thanks to its competent power management.

In addition to bundling a thorough user manual, Toshiba puts a lot of help files on the 110CT's hard drive, including information about the system's one-year warranty and round-the-clock tech support. Like many notebook vendors, Toshiba loads Windows 95 for you but doesn't give you the disks. You'll need to create a master set yourself in case anything goes wrong or you need a new driver. A special utility guides you through the procedure, which requires more than 30 floppy disks.



Toshiba Satellite

Toshiba still receives good marks for system reliability from readers responding to our ongoing fax-back survey. But in our latest poll, service satisfaction dropped to just fair. ■

Beyond the Top 20

We tested these systems along with the others, but they didn't score high enough to reach the Top 20 Notebook PCs chart. For write-ups, see PC World Online (http://www.pcworld.com/t20pcsnaps).

- **Acma 7210 P/133**
- **AMS Power CD P100**
- **AMS TravelPro P133**
- **Broadax NP8663A**
- **ChemBook 5400A-P/75**
- **ChemBook 5580 P-166**
- **Hertz Z-OptiMedia**
- **Olivetti Echos P100C**
- **Sager NP8600**

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- 5/36 Warranty with one year on-site service**

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9	○	○	○	○	○	○	○	○	○	○
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ABOUT YOUR PC

Who is the manufacturer of the PC you use most frequently?

○ Acer ○ Acma ○ ALR ○ Apple ○ AST ○ AT&T (NCR) ○ Austin (IPC) ○ Axik ○ Blackship ○ Canon ○ Compaq ○ Compudyne ○ Computrend ○ Comtrade ○ CTX ○ Dell ○ Diamond ○ Digital (DEC) ○ DTK ○ EPS ○ Epson ○ Everex ○ Future Tech ○ Gateway 2000 ○ Hewlett-Packard ○ HiO ○ Hyundai ○ IBM ○ Insight ○ Intelesys ○ Leading Edge ○ Micro Express ○ Micron ○ Midwest Micro ○ MIS ○ Nat'l Micro ○ NEC ○ Netis ○ Packard Bell ○ Panasonic ○ PerComp ○ Pionex ○ Polywell ○ Quantex ○ Robotech ○ Samsung ○ Sharp ○ Swan ○ Tangent ○ Texas Instruments ○ Toshiba ○ Twinhead ○ USA Flex ○ Vektron ○ VTech (Expotech, Laser) ○ WinBook ○ Zenith (ZDS) ○ Zenon ○ Zeos ○ Other

What size is this PC?
○ Desktop ○ Notebook/laptop ○ Handheld

What is the CPU?
○ PowerPC ○ Pentium ○ 80486 ○ 80386 ○ Other

Where did you buy this PC?
○ Local dealer ○ Mail/phone order ○ Direct from field sales force ○ Membership discount store ○ Computer superstore ○ Home electronics store ○ Retail store ○ Value-added reseller ○ Other

After ordering, how long did it take to get your PC?
○ Less than 1 week ○ 1-2 weeks ○ 3-4 weeks ○ More than 4 weeks

Who set up your PC?
○ Dealer/retailer/VAR ○ Staff computer technician ○ Self or coworker

Where do you use this PC? ○ At home/home office ○ At work ○ Both

WHEN YOU FIRST GOT YOUR PC

When did you buy this PC? (Specify month and year.)
○ Jan ○ Feb ○ Mar ○ Apr ○ May ○ June ○ July ○ Aug ○ Sept ○ Oct ○ Nov ○ Dec ○ 91 ○ 92 ○ 93 ○ 94 ○ 95 ○ 96

When you first set up your PC, were any components "dead on arrival" (DOA)?
○ Yes ○ No ○ Don't know

If so, which component was it? (Mark all that apply.)
○ Battery ○ CD-ROM ○ CPU ○ Floppy drive ○ Graphics/video board ○ Hard drive ○ Keyboard ○ Memory ○ Modem/fax board ○ Monitor/screen ○ Motherboard ○ Mouse ○ Power supply ○ Sound board ○ Other

Did your problem occur only after you added your own hardware or software?
○ Yes ○ No ○ Don't know

Would you buy this brand of PC again?
○ Yes ○ No ○ Not sure

How many times have you had a problem with this PC?
○ No problem ever ○ One ○ Two ○ Three ○ Four ○ More than four

If you have had a problem that you have not reported in a previous survey, please fill out the right column. If you are reporting a DOA for the first time, skip to the service section.

NEW PROBLEM REPORT

Answer for the most recent problem—*other than DOA*—not reported in a prior survey

When did this problem occur? (Specify month and year.)
○ Jan ○ Feb ○ Mar ○ Apr ○ May ○ June ○ July ○ Aug ○ Sept ○ Oct ○ Nov ○ Dec ○ 91 ○ 92 ○ 93 ○ 94 ○ 95 ○ 96

How long after you purchased your PC did the problem occur?
○ Less than 1 month ○ 1-3 months ○ 4-6 months ○ 7-12 months ○ More than 12 months ○ Not sure

Did the problem occur as a result of adding new hardware or software?
○ Yes ○ No ○ Don't know

Did the problem occur under warranty?
○ Yes ○ No ○ Don't know

What was the problem finally identified as? (Mark all that apply.)
○ Faulty component ○ Incorrectly installed software ○ Wrong configuration ○ Faulty peripheral ○ Device conflicts ○ OS problem ○ Other ○ Don't know

If a component failed, which one was it? (Mark all that apply.)
○ Battery ○ CD-ROM ○ CPU ○ Floppy drive ○ Graphics/video board ○ Hard drive ○ Keyboard ○ Memory ○ Modem/fax board ○ Monitor/screen ○ Motherboard ○ Mouse ○ Power supply ○ Sound board ○ Other

SERVICE

Please use this section to describe the service and support you received for the problem reported above or the DOA reported at left.

Who fixed your PC?
○ Manufacturer ○ Dealer/store where purchased ○ Manufacturer's authorized repair technician ○ Self ○ Other

What types of service and support did you receive? (Mark all that apply.)
○ Phone ○ On site ○ In store ○ System swap ○ Component swap ○ Factory return

If you received phone service, how long were you on hold?
○ Not at all ○ Less than 1 minute ○ 1-2 minutes ○ 3-5 minutes ○ 6-10 minutes ○ 11-20 minutes ○ More than 20 minutes

How long did it take before you talked to the person who finally helped you?
○ Less than 15 minutes ○ 15 minutes-1 hour ○ 2-5 hours ○ 6-10 hours ○ 11-24 hours ○ 1½-2 days ○ 3-5 days ○ 1 week or more

How long did it take to resolve the problem completely?
○ 1-2 days ○ 3-7 days ○ 8-14 days ○ 15-30 days ○ More than 1 month ○ Never resolved ○ Awaiting resolution

Was it resolved to your satisfaction?
○ Yes ○ No

How would you rate the person(s) who helped you?

	Poor		Good		Excellent
Courtesy	○	○	○	○	○
Knowledge	○	○	○	○	○
Follow-through	○	○	○	○	○

Based on the service and support you received, would you buy this brand of PC again?
○ Yes ○ No

On the whole, how satisfied are you with the service and support you received?
○ Not at all ○ ○ Satisfied ○ ○ Extremely satisfied

PLEASE FAX TO 415/357-4522. FOR BEST RESULTS, PHOTOCOPY THIS PAGE.

Give them Back-UPS® Office™ this holiday and they'll thank you 120 times a month

Take the Multipath™ Quiz for a chance to win a $2,000 Shopping Spree

The holiday season is a happy time, unless the overload of flashing lights or a starting furnace causes power sag. Then your computer pays the price for holiday cheer. A recent study by IBM showed that the typical computer experiences power problems up to 120 times a month. In fact, corrupt power is the largest single cause of computer data loss and hardware damage.

Back-UPS Office provides reliable power for your entire system. Instantaneous battery backup ensures uninterrupted operation of your CPU, monitor and an external storage device. Full-time surge suppression and site-wiring fault protection spreads a true Multipath™ safety net under any remaining interfaced peripherals, like modems, printers, fax machines and phone systems. Back-UPS Office also provides convenient BlockSafe™ outlet spacing to handle all size plugs – even large transformer blocks.

APC Uninterruptible Power Supplies provide instant battery backup to protect your data from damage. Units are even covered by up to $25,000 in Lifetime surge protector insurance. No wonder the world's leading computer experts recommend APC.

Unique Multipath protection keeps your PC and data safe

Plugging a phone line into your computer doubles your vulnerability to power problems; add any peripheral, and it triples. Even if your AC power-line is shielded, when a surge hits an unprotected peripheral, it can blaze down serial and data lines, and toast your expensive PC.

Back-UPS Office protects your entire system

Until now, protection for your entire system required several devices. But multi-device protection can leave you vulnerable to line noise and unwanted data glitches created by the voltage differential between outlets. Those glitches are prevented with the Back-UPS Office common voltage reference.

Back-UPS Office's compact design installs easily on desktop, floor or mounts to wall

Back-UPS Office means true Multipath™ protection, clean, safe power to every peripheral, and instant battery backup to keep your cutting edge system and O/S from crashing. It means protection goes less by integrating the security of a surge suppressor with the power of a 250 VA UPS, guaranteed up to $25,000 (see policy for details).

LIFETIME EQUIPMENT PROTECTION

$25,000

[illegible]

"...for any PC today—especially if you run your business on it — [a UPS] is an indispensable peripheral." — PC MAGAZINE

APC has won more awards for reliability than all other UPS vendors combined.

APC Multipath Quiz Rules:
Follow the instructions on the reply card for a chance to win a shopping spree at a participating store (listed below).

Prizes:	
First:	$2,000
Second:	$1,000
Third:	$500

Complete the quiz at www.apc.com and be entered in a second drawing for a free t-shirt! All entries must be received by 12/01/96. Drawing to be held 12/15/96.

COMP USA · MICRO CENTER · Fry's · WIZ

WIN A $2,000 SHOPPING SPREE!

Answer the quiz questions correctly (Hint: Answers are in the ad), fill out the information below completely and send to APC or enter from our PowerPage™ on the Web, for a chance to win a $2,000 Shopping Spree. We'll send you a Free 60 page Power Protection Handbook just for trying.

1. Multipath power protection means surge suppression on...
   ☐ Dataline ☐ Computer AC ☐ Peripheral AC ☐ All of the above
2. APC will repair or replace any equipment properly attached to a Back-UPS Office up to...
   ☐ $1,000 ☐ $5,000 ☐ $25,000
3. If I plug my external modem into a surge suppressor and the dataline into the wall, my computer is safe from power problems. ☐ True ☐ False
4. My transformer block plugs will fit Back-UPS Office without covering an extra outlet.
   ☐ True ☐ False

Name: _____ Title: _____

Company: _____

Address: _____

City: _____ State: _____ Zip: _____ Country: _____

Phone: _____ Fax: _____

E-Mail: _____

Is this your first contact with APC? ☐ Yes ☐ No I am an: ☐ End User ☐ Reseller

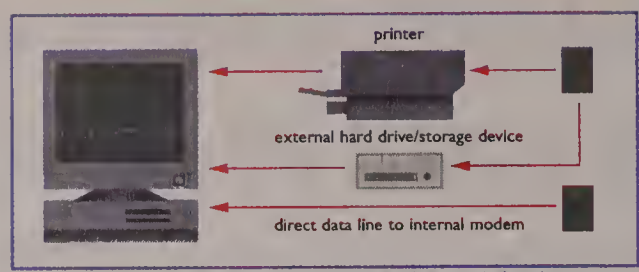
# of workstations on site/sold per month: _____ Brand of UPS currently used/sold: _____

Over 6,000,000 satisfied customers insist "Protect ME! with APC".

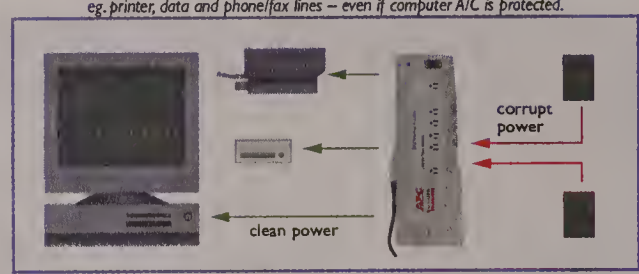
Steve Richbourg
Senior Power Quality Engineer
Gulf Power Company

"I just got my first Back-UPS Office. I've purchased seven since because people keep stapping by my desk and saying they want it! Recommending power protection is what I da for o living, and I've never had an upset customer in more than four yeors recommending APC."

Multipath™ Means Total Power Protection



Bad power (red) con enter o computer system through multiple paths eg. printer, data and phone/fax lines – even if computer A/C is protected.

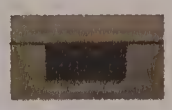


The Multipath™ protection of Back-UPS® Office™ shields your peripherals ond guards your computer from bad power on every path, providing cleon, safe power (green), to your entire system.

Back-UPS Office award-winning features:

Integrates the Security of a Surge Suppressor with the Power of a UPS
Six outlets guard your hardware with full-time surge protection. Three of the six outlets provide instantaneous battery backup to keep your system from crashing in the event of brownout or blackout.

Internet Ready Fax/ Modem Protection
Back-UPS Office's built-in phone line/10 Base-T network cable surge protection prevents surges from damaging internal & external modems, motherboards, 10 Base-T lines, input/output cards, and other system components.



Convenient BlockSafe™ Outlet Spacing
Back-UPS Office's outlets are spaced to accommodate all size plugs, including large transformer blocks.

Master On/Off Switch
One switch conveniently controls power to entire connected system.

Electrical Wiring Fault Indicator Saves Trouble and Expense
Without a proper ground, most surge protection is useless. Back-UPS Office alerts you to wiring problems such as a missing ground and reversed polarity, two common miswirings which otherwise would require an electrician's visit to diagnose.

Circuit Breaker
Provides protection in the event of an overload or short circuit; no fuse, no hassle.

Check Battery Warning Prevents Downtime Before it Occurs
An LED signals when Back-UPS Office's internal self test finds the battery near the end of its life, giving you 6-8 weeks warning.

$25,000 Equipment Protection Policy
If your properly connected equipment is ever damaged by an AC surge, including surges due to lightning, APC will repair or replace our product and up to $25,000 of connected equipment for as long as you own your Back-UPS Office. (See policy for details.)

User Replaceable Batteries
Back-UPS Office has user replaceable batteries that can be be easily swapped out, saving time and expense: no need to return the UPS to the factory for service. Batteries last 3-6 years under normal usage.

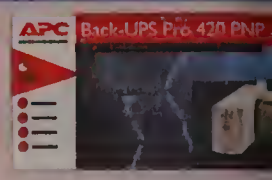
2 Year Warranty
Unmatched reliability means you can purchase all APC products with confidence.

You can also register to win at the PowerPage™ on the World Wide Web at http://www.apcc.com

Place Stamp Here

AMERICAN POWER CONVERSION
Dept. P3
132 Fairgrounds Road
P.O. Box 278
West Kingston, RI 02892-9920

Choose the Right APC Protection

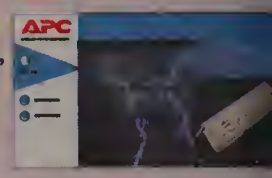


- For **advanced PC protection,** including automatic voltage regulation, CellGuard battery management and phone line/10BaseT protection, choose the Back-UPS Pro. For longer runtime choose a higher VA rating.

Back-UPS PRO Advanced PC Protection

For Pentium, 486, Win 95, and Business Applications

Volt-Amp Rating	List Price	Runtime*
280PNP	$199	6 min.
420PNP	$339	8 min.
650PNP	$419	17 min.
1000**	$589	35 min.
1400**	$759	74 min.



- For **Multipath™ PC and peripheral protection,** choose new Back-UPS Office, featuring 6 outlets with guaranteed surge protection, 3 of which provide instantaneous battery backup, fax/modem protection, and BlockSafe™ outlet spacing for the accommodation of all size plugs and transformer blocks.

Back-UPS Office Multipath™ Protectio

For 386, Entertainment, education & all peripherals

Volt-Amp Rating	List Price	Runtime
250	$179	10 min.

- For **Basic PC protection,** choose from the Back-UPS family (software not included).

Back-UPS Basic PC Protection:

For 286, 386, Entertainment, and education

Volt-Amp Rating	List Price	Runtime*
200	$119	-
280	$139	7 min.
400	$199	13 min.
450	$254	24 min.
600	$359	31 min.
900	$529	47 min.
1250	$689	75 min.

- **For Fileserver protection,** ask for our award-winning Smart-UPS® line (not shown).
- **For Datacenter protection,** ask about our Matrix-UPS line (not shown).
- **For hardware-only surge protection,** ask for APC's SurgeArrest™ line (not shown).

*Runtime shown is for typical Pentium desktop system and may vary with your actual load.
Note: Back-UPS 200 not recommended for Pentium systems
**Does not include FREE PowerChute Pro Power Management Softwa

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PC WORLD

TOP 10 PRINTERS

	MONOCHROME WORKGROUP PRINTERS	Month tested	Street price (7/23/96)	Overall rating	Speed for plain text (ppm)	Speed for full-page graphics (ppm)/kind	Comments	Reader service number
1	Lexmark Optra Lx+ 800/891-0331 http://www.lexmark.com	July 96	$1950	89	10.7	1.4/ monochrome	**FEATURES:** 16-ppm laser. Standard 4MB of RAM, 600-by-600-dpi resolution (true 1200 dpi with at least 8MB of RAM), 500 sheets input and output. **PRO/CON:** Excellent print quality, easy-to-read LCD menus on control panel. Somewhat slow, especially printing full-page graphics.	675
2	Lexmark Optra R+ 800/891-0331 http://www.lexmark.com	new	$1300	88	10.8	1.2/ monochrome	**FEATURES:** 16-ppm laser. Standard 4MB of RAM, 600-by-600-dpi resolution (true 1200 dpi with at least 8MB of RAM), 200 sheets input, 250 output. **PRO/CON:** Print quality, speed, and basic design are similar to the Optra Lx+'s, but paper capacity is lower. Upgraded model costs $150 less than previous version.	676
3	HP LaserJet 5M 800/752-0900 http://www.hp.com	July 96	$1799	87	9.5	1.1/ monochrome	**FEATURES:** 12-ppm laser. Standard 6MB of RAM, 600-by-600-dpi resolution, 250 sheets input and output. **PRO/CON:** Very good print quality; innovative, easy-to-use control panel. Maximum paper capacity is only 750 sheets; most printers on the monochrome chart have a maximum capacity of over 1000.	677
4	Okidata OL1200/PS 800/654-3282 http://www.okidata.com	July 96	$1399	87	8.9	2.3/ monochrome	**FEATURES:** 12-ppm LED. Standard 6MB of RAM, 600-by-600-dpi resolution, 500 sheets input, 250 output. **PRO/CON:** Second-lowest price on monochrome chart; good print quality and decent performance. Control panel is not as intuitive as the Optras' or the LaserJet's.	678
5	Genicom microLaser PowerPro/12 800/436-4266 http://www.genicom.com	July 96	$1439	87	10.4	2.4/ monochrome	**FEATURES:** 12-ppm laser. Standard 3MB of RAM, 600-by-600-dpi resolution, 500 sheets input, 250 output. **PRO/CON:** Fast, good price. Maximum 500-sheet paper capacity impractical for high-volume offices; on monochrome chart, only this and the HP have a maximum capacity of less than 1000 sheets.	679
	COLOR WORKGROUP PRINTERS							
1	HP DeskJet 1600CM 800/752-0900 http://www.hp.com	July 96	$1999	89	4.4	0.5/ color	**FEATURES:** 8-ppm monochrome/2-ppm color ink jet. Standard 6MB of RAM, 600-by-600-dpi monochrome, 300-by-300-dpi color. **PRO/CON:** Inexpensive for good print quality and adequate speed; PostScript and ethernet are included. Ink jet pages, unlike a laser's, are sensitive to moisture and light.	680
2	Xerox XPrint 4920 Plus 800/349-3769 http://www.xerox.com	Sept 96	$6500	86	5.5	0.3/ color	**FEATURES:** 12-ppm monochrome/3-ppm color laser. Standard 16MB of RAM, 600-by-600-dpi monochrome and color. **PRO/CON:** Superb print quality; optional feeder/printer cabinet ($1341) gives it the highest maximum paper capacity (1750) of any color laser on the chart. Slow printing full-page graphics.	681
3	Tektronix Phaser 550 800/835-6100 http://www.tek.com	July 96	$5945	85	5.6	0.5/ color	**FEATURES:** 14-ppm monochrome/5-ppm color laser. Standard 8MB of RAM, 600-by-600-dpi monochrome and color (true 1200 dpi with RAM upgrade). **PRO/CON:** Least-expensive color laser on chart, versatile paper handling accommodates labels. Proprietary RAM is expensive.	682
4	HP Color LaserJet 5M 800/752-0900 http://www.hp.com	July 96	$7395	85	6.9	0.9/ color	**FEATURES:** 12-ppm laser. Standard 6MB of RAM, 600-by-600-dpi monochrome and color, 250 sheets input and output. **PRO/CON:** Very good print quality; innovative, easy-to-use control panel. Maximum paper capacity is only 750 sheets; all others on the color chart have a maximum of over 1000 sheets.	683
5	IBM Color Network Printer 800/426-3333 http://www.ibm.com	new	$7649	83	3.9	0.6/ color	**FEATURES:** 12-ppm laser. Standard 16MB of RAM, 600-by-600-dpi monochrome and color, 250 sheets input, 500 output. **PRO/CON:** Very good print quality, top-notch support policies. Slow printing monochrome text; documentation and drivers didn't match at time of testing.	–

Best Buy Windows 95-certified Plug and Play http://www.pcworld.com/t10printers All products: 905

HOW WE TEST The overall rating for both monochrome and color workgroup printers is based on print quality (27 percent), price (20 percent), features and ease of use (20 percent), speed (15 percent), service and support (13 percent), and cost of consumables (5 percent). For all ratings, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

EMERGING FROM a five-year noncompete agreement with spin-off company Lexmark, IBM has announced its own line of printers. This month the first of these products to hit the streets, the Color Network Printer, just makes our Top 10 Printers chart.

We like the quality of the IBM's text and color graphics. Its text speed is a little slow compared with that of its peers, but its graphics speed is among the fastest, thanks in good part to the ▶

high-end Fiery controller from EFI. Early versions of the Fiery in color lasers from Canon and Digital printed fuzzy text using Word 7.0, but EFI seems to have fixed the problem—the IBM showed no sign of it. And while the IBM's $7649 price makes it the most expensive color printer on the chart, it's still the least expensive of the Fiery-driven color lasers.

Setting up the Color Network Printer, however, was harder than we expected. The documentation—five overwhelming volumes—describes how to install the Windows 95 driver, but IBM, eager to ship the printer, did not include the driver itself on the first version of its CD-ROM. We downloaded the driver from IBM's Web site, but it arrived in a compressed DOS batch file that we couldn't install without IBM's help. It was lucky we called: IBM told us the work-arounds to some undocumented bugs in the driver. According to IBM, the CD-ROM will include the driver by the time you read this.

The Canon C LBP 360PS we tested has the same print engine as the IBM Color Network Printer and comparable print quality and speed. It didn't make the chart because at $10,625, it's too expensive, and it's also too Macintosh oriented. Its caching hard drive is available only to Mac users, and its spooler and downloader work only on AppleTalk networks.

The HP DeskJet 1600CM is still our color Best Buy. This ink jet competes with color lasers by providing good print quality and acceptable speed at a terrific price of only $1999.

This month we tested three new monochrome printers: the Apple LaserWriter 12/640 PS, the Lexmark 4039 10plus, and an upgraded Lexmark Optra R+. Only the Optra R+ makes the chart, landing in second place. It now comes standard with 4MB of RAM and costs only $1300 (the previous version had 2MB and cost $1450). Lexmark also offers an $869 1500-sheet input feeder that boosts Optra printers' input capacity beyond that of any other workgroup printer we've tested. Speed, print quality, and other features remain the same.

BIG BLUE TURNS COLORS: IBM's first color laser, the Color Network Printer, uses the well-regarded Canon engine to produce some of the best color print quality we've seen.

LEXMARKS TOP THE CHART

LEXMARK'S higher-end Optra Lx+ is still our monochrome Best Buy. It has better graphics speed and paper capacity than the second-place Optra R+, and its 75,000-page monthly duty cycle is highest on the chart. Contrary to information the company provided earlier, however, Lexmark does not offer toll-free technical support.

Apple's $1599 LaserWriter 12/640 PS just misses the chart. Its text and line art print samples are as crisp as any we've seen, but gray-scale images on photographs look a little jagged on curves, even with the printer's PhotoGrade image enhancement. It's the fastest printer we've tested at churning out graphics but relatively slow printing text documents.

Unfortunately, the LaserWriter is not yet Windows 95–certified Plug and Play. And in our lab tests, the LaserWriter had an annoying habit of curling pages. Our lab is warm, but it's not damp; your office's climate may produce different results.

Lexmark's $1399 4039 10plus is inexpensive but too meagerly configured to make the chart. The printer's standard 2MB of RAM is insufficient for printing our full-page graphics samples at its default 600-dpi resolution; we had to reduce print resolution to 300 dpi to complete the test. When we printed the pages, the 4039 10plus's gray-scale graphics looked muddy. The outdated documentation refers to Windows 3.1 as something new; you have to download Windows 95 drivers from Lexmark's Web site.

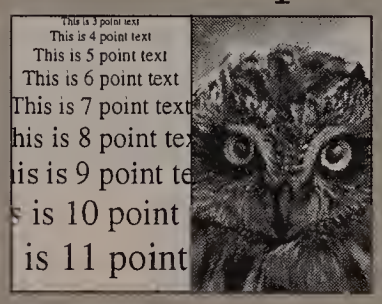
In our September issue, we began listing print speed in pages per minute for text and graphics rather than giving monochrome and color scores. Our Overall ratings in this issue have been adjusted to reflect the new values.

—Dan Littman and Melissa Riofrio

Dan Littman has covered printers and other computer technologies for ten years. Melissa Riofrio is a PC World *associate editor. Testing performed by Dave Casini of the PC World Test Center.* ■

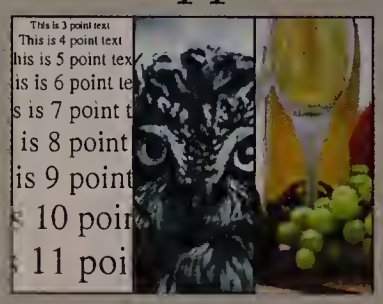
PRINT QUALITY SAMPLES

Good Output From Apple and IBM Printers



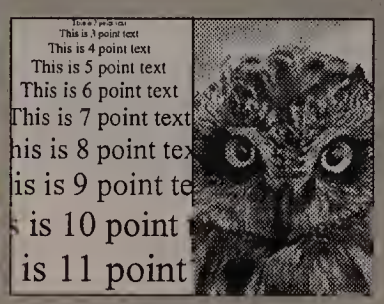
APPLE LASERWRITER 12/640 PS

The LaserWriter's text quality is very good. Gray-scale prints, while finely shaded, are jagged along the curves—even with the Apple's PhotoGrade enhancement turned on.



IBM COLOR NETWORK PRINTER

You'll get well-drawn text and superb color from the Color Network Printer. Gray-scale quality, as with many color lasers, suffers from a green or blue tinge, but the shading is evenly cast.



LEXMARK 4039 10PLUS

Lexmark's older, low-end workgroup laser prints text well, but its gray-scale images are disappointingly muddy. Also, we had to upgrade this printer's standard RAM to get it to print full-page graphics.

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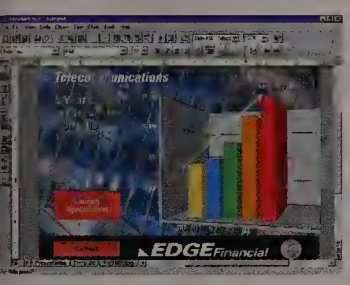

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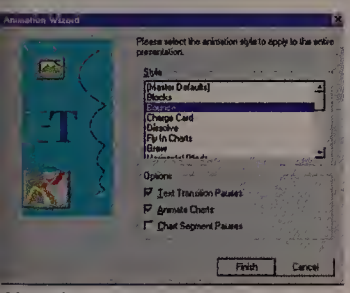

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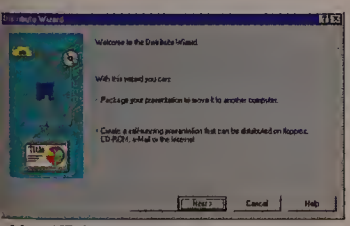

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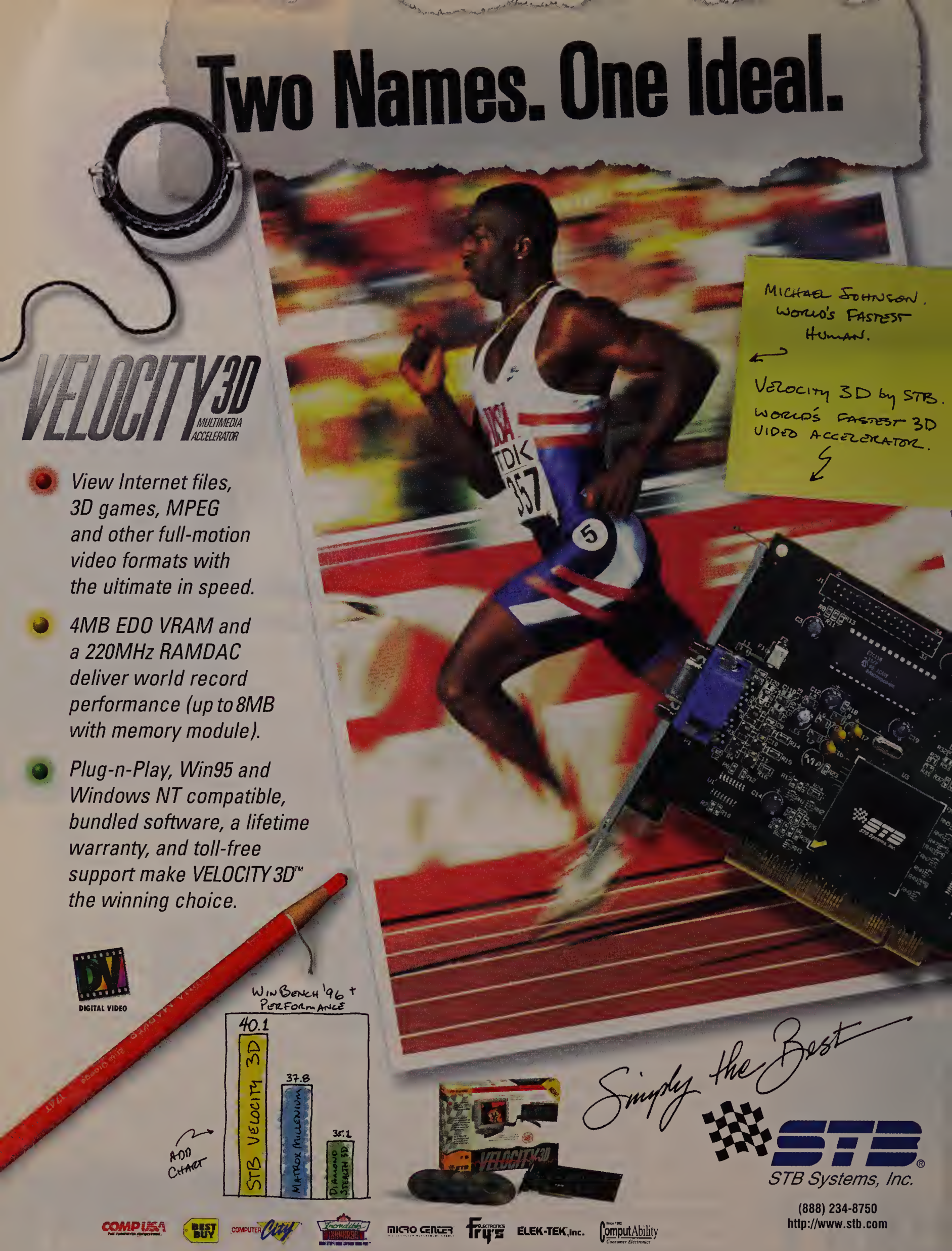

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Copyright 1996 STB Systems, Inc. All rights reserved. All trade names referenced are the trademarks, service marks, or registered trademarks of their respective holders. For a copy of the terms of the limited lifetime warranty contact STB Systems at (214) 234-8750 †WinBench 96 1.0 tests conducted on a Gateway 2000 (model P5-166,w/Windows95) 166MHz Pentium, PCI 2.0 Bus, 512KB Pipeline cache, 16MB EDO DRAM, Caviar IDE HD, 1024x768 with65,000 colors at 75Hz refresh. STB VELOCITY 3D™, Matrox Millennium, and Diamond Stealth 3D 2000 were tested using driver versions 1.23, 4.03.00.3110 and 4.02.12 respectively. Prices and specifications subject to change without notice.

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PC WORLD

TOP 10 MONITORS

	20- AND 21-INCH MONITORS	Month tested	Street price (8/1/96)	Overall rating	Quality of text/graphics	Comments	Reader service number
1	Samsung SyncMaster 20GLsi 800/933-4110 http://www.sosimple.com	new	$1285	82	good/ very good	**FEATURES:** 20-inch tube (18.4-inch viewable screen), .28mm dot pitch, 77-Hz refresh rate [1], Level 2b Plug and Play ready [2], color and screen adjustment software, three-year parts and labor warranty, 24-hour daily toll-free support. **PRO/CON:** Terrific price, very sharp graphics, ample on-screen menus; small viewable screen.	699
2	Compaq QV210 800/345-1518 http://www.compaq.com	retested this month	$1825	79	very good/ very good	**FEATURES:** 21-inch tube (19.5-inch viewable screen), .26mm dot pitch, 85-Hz refresh rate [1], Level 2b PnP ready [2], three-year warranty on parts, one year on labor, 24-hour daily toll-free support. **PRO/CON:** $274 price drop, very sharp text, realistic graphics, uniform brightness; much button pushing needed to adjust screen.	700
3	Cornerstone Color 21/88 fp 800/562-2552 http://www.corimage.com	retested this month	$2128	78	very good/ very good	**FEATURES:** 21-inch tube (19.7-inch viewable screen), .27mm dot pitch, 87-Hz refresh rate [1], Level 2ab PnP ready [2], three-year parts and labor warranty, 11.5-hour weekday toll-free support. **PRO/CON:** Very crisp text, vivid graphics, big viewable screen, rapid refresh, easy-to-adjust menu; expensive despite $667 price drop.	701
4	ArtMedia TN2185T 800/278-6334 http://www.artmedia.com	new	$1638	78	very good/ good	**FEATURES:** 20-inch Trinitron tube (18.7-inch viewable screen), .30mm stripe pitch, 75-Hz refresh rate [1], Level 2ab PnP ready [2], three-year warranty on parts, one year on labor. **PRO/CON:** Very sharp text, bright graphics, TCO-92 low emissions approved, easy-to-adjust on-screen menu; name implies a bigger model.	702
5	ViewSonic PT810 800/888-8583 http://www.viewsonic.com	new	$1795	76	good/ very good	**FEATURES:** 21-inch Diamondtron tube (19.3-inch viewable screen), .30mm stripe pitch, 89-Hz refresh rate [1], Level 2b PnP ready [2], color calibration software, three-year parts and labor warranty, 11-hour weekday toll-free support. **PRO/CON:** Accurate color graphics, ample on-screen menus include moiré tool; fussy button controls.	703
6	MAG InnoVision MX21F 800/827-3998 http://www.maginnovision.com	retested this month	$1639	76	very good/ very good	**FEATURES:** 21-inch tube (19.7-inch viewable screen), .28mm dot pitch, 76-Hz refresh rate [1], LCD window, three-year warranty on parts, two years on CRT, one year on labor, 12-hour weekday toll-free support. **PRO/CON:** Very sharp text and graphics, big viewable screen; awkward control buttons, no on-screen menus, no PnP.	704
7	Cornerstone Color 21/75 fp 800/562-2552 http://www.corimage.com	new	$1935	75	good/ very good	**FEATURES:** 21-inch tube (19.7-inch viewable screen), .27mm dot pitch, 75-Hz refresh rate [1], Level 2ab PnP ready [2], three-year parts and labor warranty, 11.5-hour weekday toll-free support. **PRO/CON:** Very good graphics detail, accurate color, big viewable screen, comprehensive on-screen menus, easy to adjust; high price.	705
8	Mitsubishi Diamond Scan 20H 800/843-2515 http://www.mitsubishi-display.com	retested this month	$1499	75	satisfactory/ good	**FEATURES:** 20-inch tube (19.1-inch viewable screen), .28mm dot pitch, 75-Hz refresh rate [1], Level 2b PnP ready [2], color and screen adjustment software, three-year parts and labor warranty, 8.5-hour weekday toll-free support. **PRO/CON:** $52 price drop, big viewable screen, ample on-screen menus, TCO-92 compliant; faint text fuzz.	706
9	Mitsubishi Diamond Pro 21TX 800/843-2515 http://www.mitsubishi-display.com	new	$1899	74	good/ good	**FEATURES:** 21-inch Diamondtron tube (19.7-inch viewable screen), .30mm stripe pitch, 87-Hz refresh rate [1], Level 2b PnP ready [2], color and screen adjustment software, three-year parts and labor warranty, 8.5-hour weekday toll-free support. **PRO/CON:** Big viewable screen, ample on-screen menus, TCO-92 compliant; expensive.	707
10	CTX 2085 800/888-2012	retested this month	$1129	72	satisfactory/ good	**FEATURES:** 20-inch tube (18.9-inch viewable screen), .28mm dot pitch, 80-Hz refresh rate [1], Level 2b PnP ready [2], color and screen adjustment software, three-year warranty on parts and labor, two years on CRT, 10-hour weekday toll-free support. **PRO/CON:** Lowest price on chart, easy-to-adjust on-screen menus; fuzzy text.	708

Best Buy http://www.pcworld.com/t10monitors All products: 909

[1] Highest refresh rate at 1280 by 1024 resolution. [2] Level 2b Plug and Play monitors and graphics cards can communicate bidirectionally; Level 2ab uses Access.bus to enhance synchronization. However, Windows 95 does not fully utilize monitor Plug and Play.

HOW WE TEST Ten judges rate a monitor's text and graphics quality. We evaluate each unit on how well it displays typical business letters, spreadsheets, Web pages, and scanned images. The overall rating is based on text and graphics quality (25 percent each), features and ease of use (25 percent), price (20 percent), and service and support (5 percent). The best possible overall rating is 100. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

USING A 20- OR 21-INCH MONITOR is a lot like having an IMAX screen on your desktop. At first, the vast display is overwhelming, but after a week without scrolling or toggling between applications, you'll wonder how you ever worked without it. Unfortunately, the price of these giant screens can be a jolt—they average $600 more than 17-inch models. Among 20- and 21-inch monitors, you can spend over $2100 for a high-end unit or ▶

around $1100 for a basic one. The good news is that prices have taken a tumble. The Cornerstone Color 21/88 fp, for example, dropped $667 since our review in May, and the Princeton Graphic Ultra 20, which didn't make the chart, costs about $100 less than a high-end 17-inch display.

SO WHICH ONE'S THE BEST?

ALL TOLD, WE TESTED 14 monitors for this month's review. Using our new test suite, we retested 5 units from last May's Top 10, and 9 new units, including updates of two of the May monitors. (IBM's P200, NEC's MultiSync XP21, and ViewSonic's 21PS have been discontinued.) Of the 14, the $1285 Samsung SyncMaster 20GLsi earned our top Best Buy. It's the best value if you do a lot of graphics on a tight budget. The 20GLsi is an upgrade to the 20GLs model (number two in May) and includes screen and color calibration software and Plug and Play support. Graphics were so sharp that we spotted a detail we hadn't seen before in one of our sample images—tiny beads of sweat on a runner's brow. Text looked good, but we deducted points for a fuzzy Web-page address. At 18.4 inches, the viewable screen size is also a tad small.

In second place is the $1825 Compaq QV210. Shedding $274 since May, this high-end 21-inch monster moves into our other Best Buy spot. Text looked razor sharp, and colors on our sample image of fruit were brilliant. The QV210's on-screen menus are extensive, but the control panel buttons can be tiring—it takes seven clicks just to center the picture. Fortunately, there are dials to adjust contrast and brightness.

The huge price cut lifted the 21-inch Cornerstone Color 21/88 fp clear up to third place, from number eight. At $2128, it's still the most expensive monitor reviewed here, but text and graphics were the best of the bunch.

New this month is the $1638 ArtMedia TN2185T in fourth place. This 20-*inch* monitor's forte is text-intensive projects. Tiny type serifs were very sharp on this Trinitron tube. Graphics also looked good, but our sample fruit image looked less appetizing than on other units. This is the only unit we saw that comes with a focus control so the monitor stays sharp as it ages.

The updated ViewSonic PT810 ($1795) lands in fifth place. Now it can refresh at higher rates, and the on-screen menus are expanded (there's a new moiré control). Unlike its predecessor, which cost $400 more, the new PT810 displayed graphics a tad better than text in our higher-resolution tests. Our sample runner image looked realistic, but we noticed slightly fuzzy type on our business letter and spreadsheet screens. One thing hasn't changed: The on-screen menus require too much button pressing.

A former Best Buy, the $1639 MAG InnoVision MX21F shed $61, but it dropped to number six due to the lack of on-screen menus and Plug and Play support, and a less extensive warranty.

GOOD 'N' PLENTY: For a modest $1285, Samsung's new 20-inch SyncMaster 20GLsi doesn't compromise on high-end features.

Four monitors earned the remaining Top 10 slots. The $1935 Cornerstone Color 21/75 fp (in seventh place) uses a less expensive tube than its 21/88 fp sibling and has a lower refresh rate (75 Hz at 1280 by 1024 versus 87 Hz), but the 21/75 fp is just as adept at high-end graphics. On the other hand, spreadsheet cells looked sharper on the higher-ranking model. Like its sibling, the 21/75 fp is expensive. The number eight Mitsubishi Diamond Scan 20H is followed by its high-end relative, the Diamond Pro 21TX, in ninth place. Both sport ample on-screen menus, adjustment gauges for precise tweaking, and color and image correction software. But the screen quality of both units was not as dazzling as higher-ranked competitors'. The least expensive monitor on the Top 10 this month is the $1129 CTX 2085 (formerly in sixth). But so-so image quality in our tough new tests pushed it to the bottom of our chart.

Despite tempting low prices, four new 20-inch monitors didn't make our list: the $1149 Pacom 9Fes, the $1099 Princeton Graphic Ultra 20, the $1180 Techmedia TCM-2000G, and the $1195 ViewSonic 20G. All use Plug and Play and on-screen menus, but screen quality lacked luster.

—*John Goddard* ■

John Goddard is a staff editor for PC World. *Testing by Jeff Kuta and Susan Silvius of the PC World Test Center.*

Small Questions for Big Thinkers

BEFORE YOU BUY A MONSTER MONITOR, ask yourself a few questions:

Have you considered hidden costs? If you plan to do *anything* graphical at 1280 by 1024 resolution and in more than 256 colors, you'll need at least 4MB of WRAM or VRAM (about another $150) on your graphics card. If you can't upgrade the card, expect to pay between $350 and $600 for a new one with 4MB of graphics memory on board.

How big is your work space? Make sure to measure where you'll put your monitor before you buy it. A 20- or 21-inch model doesn't just sit on your desktop, it dominates it. Most units measure at least 20 inches deep as well.

How will you get this gentle giant into your office? These overgrown monitors look rugged, but the big tube inside is sensitive. Check the packaging for damage before accepting it, and if possible plug in the monitor and see how symmetrical the screen geometry is before you buy the unit. More important: Watch your back when lifting a monitor this big. Bring in a friend or two to help you—on average, these models weigh about 75 pounds.

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PC WORLD

TOP 10 GRAPHICS BOARDS

	GRAPHICS BOARDS	Month tested	Street price (8/9/96)	Overall rating	PC WorldBench graphics score	Comments	Reader service number
1	VideoLogic GrafixStar 600 800/578-5644 http://www.videologic.com	Oct 96	$159	96	185 very good	**FEATURES:** 2MB MDRAM, 120-Hz refresh rate at 1024 by 768, bundled multimedia applications, Xing MPEG software, DirectVideo, Tseng Labs ET6000 chip. **PRO/CON:** Fast with business and graphics programs, inexpensive, excellent utilities, top-notch AVI and MPEG video; no 3-D acceleration.	601
2	STB Lightspeed 128 888/234-8750 http://www.stb.com	Aug 96	$199	95	186 very good	**FEATURES:** 2.25MB MDRAM, 120-Hz refresh rate at 1024 by 768; bilinear video interpolation, DirectVideo, Xing MPEG software, Tseng Labs ET6000 chip. **PRO/CON:** Great bang for your buck, performs well in business and graphics programs, perfect AVI video playback, excellent MPEG, lifetime warranty; no 3-D acceleration.	602
3	Diamond Stealth 3D 2000XL 800/468-5846 http://www.diamondmm.com	Sept 96	$179	94	183 very good	**FEATURES:** 2MB EDO DRAM, 100-Hz refresh rate at 1024 by 768, 3-D acceleration, bundled games, Mediamatics MPEG software, DirectVideo, S3 Virge chip. **PRO/CON:** Now comes with Diamond's InControl Tools for controlling the display, performs like a board with costlier memory, excellent MPEG playback; tech support can be hard to reach.	603
4	Hercules Dynamite 128/Video 800/532-0600 http://www.hercules.com	new	$229	92	185 very good	**FEATURES:** 2MB MDRAM, 90-Hz refresh rate at 1024 by 768, bilinear video interpolation, Xing MPEG software, DirectVideo, Tseng Labs ET6000 chip. **PRO/CON:** Handles business and graphics programs equally well, nice set of software utilities, toll-free support; weak documentation, no 3-D accleration.	604
5	Matrox MGA Millennium 800/361-1408 http://www.matrox.com	June 96	$269	91	184 very good	**FEATURES:** 2MB WRAM, 120-Hz refresh rate at 1024 by 768, 3-D acceleration, 3-D software, optional MPEG and TV tuner cards, Compcore MPEG software, DirectVideo, Matrox MGA-2064W chip. **PRO/CON:** Fast, holds 8MB for high-resolution photo editing, superb AVI video; poor MPEG, expensive.	605
6	ATI 3D Xpression 905/882-2600 http://www.atitech.ca	Sept 96	$159	91	174 good	**FEATURES:** 2MB EDO DRAM, 100-Hz refresh rate at 1024 by 768, 3-D acceleration, optional MPEG and TV tuner cards, ATI MPEG software, ATI 3D Rage chip. **PRO/CON:** $40 price drop, affordable all-in-one board with 3-D functions, faster in Windows than ATI Video Xpression, good MPEG playback; not ideal for high resolutions.	606
7	STB Powergraph 64 Video 888/234-8750 http://www.stb.com	June 96	$129	91	175 good	**FEATURES:** 2MB EDO DRAM, 120-Hz refresh rate at 1024 by 768, optional MPEG and TV tuner cards, Xing MPEG software; S3 Trio64V+ chip. **PRO/CON:** Low price, fast at resolutions above 800 by 600, good MPEG playback, lifetime warranty, toll-free support; not the best choice for image editing or desktop publishing.	607
8	Cardex Challenger EV 800/539-2273	Oct 96	$179	90	187 very good	**FEATURES:** 2.25MB MDRAM, 75-Hz refresh rate at 1024 by 768, optional TV tuner card, Xing MPEG software, DirectVideo, Tseng Labs ET6000 chip. **PRO/CON:** Top performer by a hair, great all-around board, excellent AVI playback; low refresh rate, old Windows 3.1 software utilities, poor MPEG playback.	608
9	Number Nine 9FX Reality 332 800/438-6463 http://www.nine.com	new	$199	90	180 very good	**FEATURES:** 2MB EDO DRAM, 120-Hz refresh rate at 1024 by 768, 3-D acceleration, bundled games, DirectVideo, Mediamatics MPEG software, S3 Virge chip. **PRO/CON:** Gaming board that's also strong in business programs, perfect AVI video, excellent MPEG playback; no toll-free or weekend support.	609
10	Diamond Stealth64 Video 2201 800/468-5846 http://www.diamondmm.com	Oct 96	$143	89	172 good	**FEATURES:** 2MB EDO DRAM, 100-Hz refresh rate at 1024 by 768, optional MPEG and TV tuner cards, Mediamatics MPEG software, S3 Trio64V+ chip. **PRO/CON:** Inexpensive board suited for basic Windows programs, good InControl utilities for customizing the display; choppy AVI, poor MPEG playback.	610

Best Buy Windows 95-certified Plug and Play http://www.pcworld.com/t10graphics All products: 901

HOW WE TEST We tested boards under Windows 95 with PC WorldBench 1.0 at 800 by 600 resolution at 16.8 million colors (reported here) and at 1024 by 768 at 65,536 colors. Boards were tested in a Dell Dimension XPS P133c with 16MB of EDO DRAM and 256K of pipeline-burst secondary cache. Overall rating is based on performance (40 percent), features (30 percent), price (20 percent), and support policies (10 percent). For all ratings, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

TWO BOARDS BASED ON THE HOTTEST new graphics technologies land on this month's chart. The new $229 Hercules Dynamite 128/Video, ranked fourth, uses the same 128-bit processor and multibank DRAM as the top-rank VideoLogic board to produce impressive performance. Meanwhile, the new $199 Number Nine 9FX Reality 332, ranked ninth, handles graphics well and features 3-D acceleration. ■

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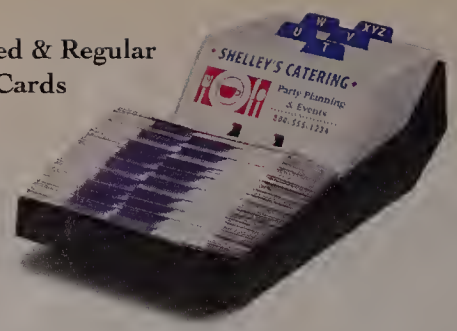

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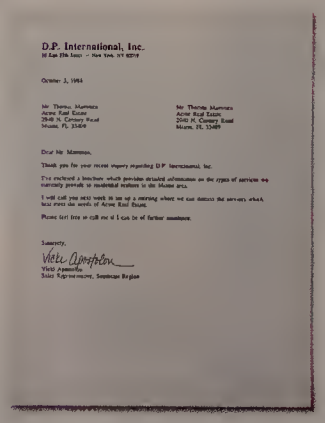

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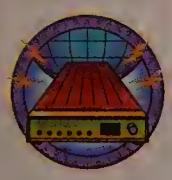
PC WORLD

TOP 10 MODEMS

	INTERNAL DESKTOP MODEMS	Street price (8/15/96)	Overall rating	Average transfer time per MB	ISA card type	Comments	Reader service number
1	Motorola LifeStyle 28.8 800/566-3266 http://www.mot.com/modems	$175	81	2:32	16-bit	**FEATURES:** Fax Class 1, Distinctive Ring, Caller ID detection, phone jack turns off during connect, QuickLink II software, toll-free support 9 hours per weekday. **PRO/CON:** Top performer on chart, toll-free support, very good documentation, easy installation; pricey for a modem without voice features.	720
2	Cardinal MVP288IS 800/775-0899 http://www.cardtech.com	$189	77	2:48	8-bit	**FEATURES:** V.FC, Fax Class 1 and 2 (protocol), supports MNP-10EC cellular error control protocol, FlashROM, VoiceView, voice mail, full-duplex speakerphone and mike, FaxWorks 3.0, lifetime warranty. **PRO/CON:** One of the best feature sets we've seen, installation was a breeze; a bit pricey and bulky.	721
3	U.S. Robotics Sportster Faxmodem 800/342-5877 http://www.usr.com	$159	76	2:48	8-bit	**FEATURES:** 33.6-kbps, V.FC, Fax Class 1 and 2.0 (standard), QuickLink II fax/data software, five-year warranty, support 10 hours per weekday. **PRO/CON:** Good price, only modem on chart that offers a choice of Plug and Play or manual installation, excellent software bundle; unremarkable performance.	722
4	Zoom V.34I FaxModem Model 275 800/631-3116 http://www.zoomtel.com	$109	76	2:51	8-bit	**FEATURES:** V.FC, MNP-10EC, Fax Class 1 and 2 (protocol), Comit for Windows and WinFax Lite, Distinctive Ring, seven-year warranty, support 14.5 hours per weekday, weekend hours. **PRO/CON:** Least expensive modem on chart, backed by very good support policies; basic features, a little slow, hard to install.	723
5	Hayes Total Internet Solution 770/840-9200 http://www.hayes.com	$163	76	2:54	16-bit	**FEATURES:** V.FC, Fax Class 1 and 2 (protocol), Distinctive Ring, SmartCom Message Center LE fax/data software, toll-free tech support. **PRO/CON:** One of the best packages for getting up on the Internet quickly, installation was very easy, very good support policies; slow performer.	724
6	Hayes Total Gaming Solution 770/840-9200 http://www.hayes.com	$259	75	2:47	16-bit	**FEATURES:** V.FC, Fax Class 1 and 2 (protocol), voice mail, DSVD, VoiceView, full-duplex speakerphone, Distinctive Ring, Caller ID, toll-free support. **PRO/CON:** Painless installation, extensive support for voice/data line sharing, comes with an ample software bundle; most expensive package on chart.	725
7	E-Tech Bullet PC288MX 800/328-5538 http://www.bulletel.com	$152	75	2:42	8-bit	**FEATURES:** V.32ter, Fax Class 1, 2 (protocol), and 2.0 (standard), Comit Lite for Windows and WinFax Lite, two-year warranty, toll-free tech support, overnight replacement. **PRO/CON:** Above-average speed, decent price; minimal documentation, minimal feature set, installation could require a call to tech support.	726
8	Microcom DeskPorte 28.8S 800/822-8224 http://www.microcom.com	$143	75	2:47	8-bit	**FEATURES:** V.FC, Fax Class 1 and 2 (protocol), MNP-10EC cellular protocol, Distinctive Ring, FaxWorks 3.0, five-year warranty, tech support available 12 hours per weekday. **PRO/CON:** Attractive price, friendly documentation; card is not Plug and Play and doesn't have much in the way of features.	727
9	Boca Bocamodem V.34 28800bps 561/997-7202 http://www.bocaresearch.com	$179	75	2:44	8-bit	**FEATURES:** V.FC, Fax Class 1 and 2 (protocol), FaxWorks 3.0, five-year warranty, 10.5 hours per weekday of technical support. **PRO/CON:** A little faster than the average, small, manuals are quite understandable; pricey for a non-Plug and Play modem that doesn't come with any extras.	728
10	Boca V.34 Office Communicator 561/997-7202 http://www.bocaresearch.com	$199	75	2:51	16-bit	**FEATURES:** V.FC, Fax Class 1 and 2 (protocol), voice mail, VoiceView, full-duplex speakerphone, FaxWorks 3.0, five-year warranty, support 10.5 hours per weekday. **PRO/CON:** Good voice features, very good software bundle; expensive, a little slow, long card may be hard to fit in some PCs.	729

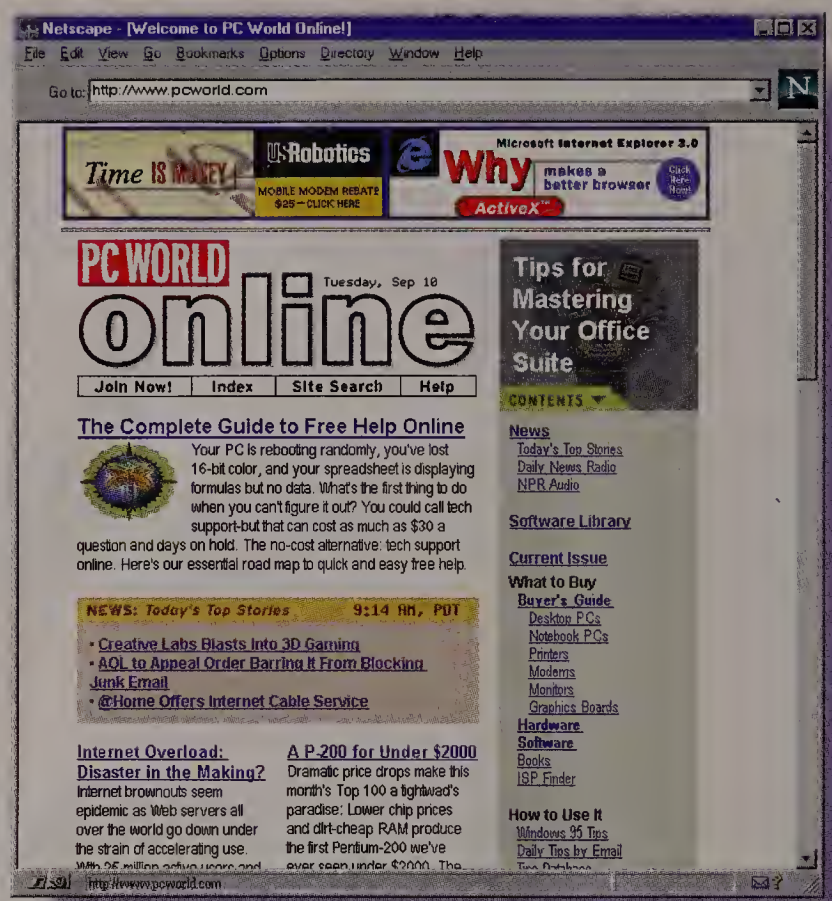
Best Buy http://www.pcworld.com/t10modems Windows 95-certified Plug and Play All products: 911

HOW WE TEST We test a pair of identical modems on a simulated phone network. For the phone line test, we send a text file over 55 line conditions. For the file type test, we send five files—a graphics, text, program, and compressed file, and a mixture of those four file types—over one line condition. We average the results of the two tests. The overall rating is based on performance (43 percent), features (26 percent), price (12 percent), support (10 percent), and ease of use (9 percent). Data based on tests designed and conducted by the PC World Test Center. All rights reserved.



MOTOROLA'S LIFESTYLE 28.8 has unmatched speed and a painless installation procedure even a neophyte can love, making it our most highly recommended unit. The runner-up modem from Cardinal clocked only average data transfer rates on our test bench, but it's chock-full of features, including voice mail, full-duplex speakerphone, and a mike, and it's a cinch to install. For our full review of the Top 10 modems, see page 190. ■

GET MORE



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Circle 172 on reader service card

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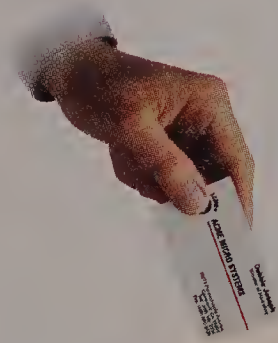

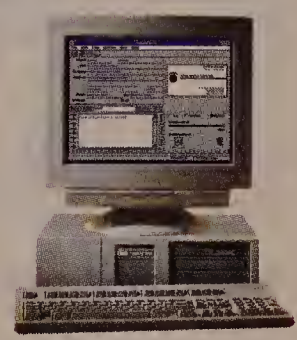

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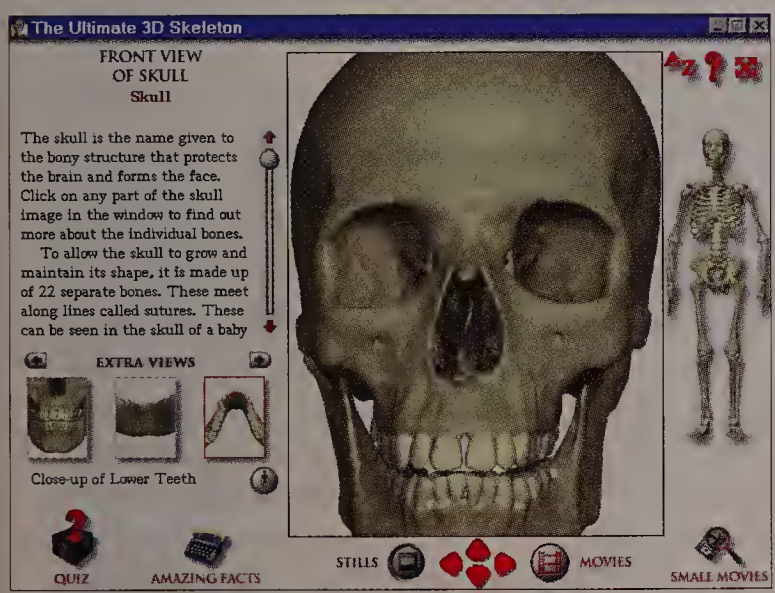
Digital Bones, Oliver Stone, and the Great Unknown

SKELETON CRUISE

CAN'T REMEMBER MORE than one line of the "hip bone's connected to the..." song? If so, you're due for an anatomy refresher course, and you've got two new CD-ROMs to get you started.



3D SKELETON: A clean interface gives you access to 3-D views, animations, and pronunciations for all the bones in the body.

A.D.A.M. Software's **A.D.A.M. The Inside Story** combines detailed, customizable anatomy illustrations with appealing humor. You can specify how you want to view a body—by gender, by skin color, with or without fig leaf, and so on. Engaging and comedic animation, narrated by Adam and Eve, explain how the body's 12 systems work. The 1997 edition lets you view the skull, heart, and lungs using stunning 3-D models. The disc also includes interactive learning games, quizzes, and Internet links. And now you can print those colorful illustrations, although you still can't copy the text.

Far more serious and straightforward is DK Multimedia's **The Ultimate 3D Skeleton,** which focuses entirely on the human body's 206 bones and offers lots of helpful pronunciations, animations, and images. You can turn bones around in 3-D views, jump to related facts, do quizzes, and copy and print images and text. Written in a dry, encyclopedia-like style, this title isn't as fun or innovative as A.D.A.M. But make no bones about it: Both programs display an impressive body of knowledge.

—James Oliver Cury

A.D.A.M. The Inside Story, 1997 Edition

GRADE: **A**; PRICE: $40 street; A.D.A.M. Software; 800/955-9920.

READER SERVICE NO. 730

The Ultimate 3D Skeleton

GRADE: **B**; PRICE: $30 street; DK Multimedia; 800/356-6575.

READER SERVICE NO. 731

WHO'S ON FIRST?

BASED ON THE popular book of the same name, **The Baseball Encyclopedia** CD-ROM includes exhaustive, searchable statistics on every major-league batter, pitcher, manager, and team in history—and throws in some choice video clips as well. You can also use the disc's links to World Wide Web sites and download the latest updates, such as box scores.

Fans of statistical analyst Bill James will enjoy the interactive game, based on his approach, that lets you build your own baseball team and see how it would fare in a virtual league. You can then pit your team against others playing on the Internet. The Baseball Encyclopedia doesn't offer the elegant graphics or solid storytelling found in Microsoft's Complete Baseball, but for statistics enthusiasts this CD-ROM, while not a home run, does clear the bases. *—Derk Richardson* ▶

Tee Time

IN REAL LIFE, you may be the world's worst golfer, but Enteractive's **Picture Perfect Golf** lets you become a pro in your dreams. In this entertaining CD-ROM game, you tee-off at the world-renowned Harbour Town Golf Links, photorealistically captured here. The $200 version of the game comes with an external golf club that you plug into your PC's serial port. As you swing the club, an infrared light beam passes over a base unit, launching the cyber-golf ball. This club is no substitute for the real thing: All the elements of a good golf swing—stance, balance, control—don't matter here as much as speed and direction. **–Angela Freeman**

Picture Perfect Golf

GRADE: **B**; PRICE: $199.95 list (club and software), $29.95 list (software only); Enteractive Inc., 800/433-4464.

READER SERVICE NO. 733

GOLF AT THE SPEED OF LIGHT: With the Virtual Reality Golf Club, it's easy swinging.

PHOTOGRAPH: ROB CARDIN

EDITED BY Christina Wood

The Baseball Encyclopedia

GRADE: **B+**; $49.95 list; Macmillan Digital USA; 800/910-0099.

READER SERVICE NO. 732

NIXON: STICKS AND STONE

LET ME MAKE THIS perfectly clear: You don't have to be a Nixon apologist to see through **Nixon: The CD-ROM,** supposedly an in-depth examination of the late former president. It offers thousands of pages of documents (many previously unpublished), transcripts of the infamous White House tapes, historical photos and video footage, and the contributions of Watergate-era staffers. But this disc is essentially an ad for Oliver Stone's recent film. Snooping through a 3-D White House, you're subjected to far too many clips of Anthony Hopkins aping the darkest and most pathetic sides of ol' Milhous. As Stone notes in his video interview, Watergate "is an old and painful thing for Americans to go through." Amen. —*D.R.*

Nixon: The CD-ROM

GRADE: **C−**; PRICE: $39.95 list; Graphix Zone, Inc.; 800/828-3838.

READER SERVICE NO. 734

HOMEWORK HELPER

WHEN I WAS a student, I had to walk barefoot to the library, in the snow. But now there's the **Mindscape Student Reference Library,** a handy collection of ten reference books on one CD-ROM. MSRL doesn't have as much multimedia content as its competitor, Microsoft Bookshelf, and its Internet link is simply a loosely filtered search on existing Word Wide Web search engines. Still, MSRL lets you batch-print in sequential order maps, articles, or other elements, and it automatically generates a bibliography of all bookmarked items. In short, you can research a report on, say, Uruguay and still have time for a round of Doom. These kids today have it made. —*Glenn McDonald*

Mindscape Student Reference Library

GRADE: **B**; PRICE: $34.99 list; Mindscape; 800/234-3088.

READER SERVICE NO. 735

JUST DOWNRIGHT WEIRD

I'VE SPENT MORE nights scaring myself silly watching *X-Files* than I dare admit. And now this: **The Unexplained,** an interactive documentary about all things creepy and weird. This disc is packed with an audio narrative, complemented by essays and vivid photography, that guides you through topics such as Earth Mysteries, Ghosts and Spirits, and Mysterious Beings. There's a lot to learn—for example, I thought that spontaneous human combustion was merely a fun topic for dinner parties. But according to The Unexplained, actual exploding bodies have been documented. The essays can be difficult to read, and the narration sometimes skips ahead before you're ready. But overall, The Unexplained is engaging; the ghost section alone is guaranteed to raise goose bumps. —*Gabrielle Mitchell*

The Unexplained

GRADE **B+**; PRICE: $30 street; FlagTower Multimedia; 800/338-2006.

READER SERVICE NO. 736

MATH MADNESS

EVER BUILT A CAR using a lobster and a perfume atomizer? Here's your chance. Designed to hone early math skills of kids ages 4 to 8, Infinity City features 50 creative activities, many of which focus on real-life tasks such as telling time, counting money, and categorizing items. Enter one of the ten colorful activity sites (which include a junkyard and a grocery store), select one of the five wacky Gigglebone Gang characters, and the fun begins. Whether they're bopping to one of Zack the Taxi Driver's catchy tunes or helping Chester the Raccoon tell time at the Guggen Time Museum, kids will keep coming back to Infinity City. —*Anne Kandra*

Infinity City

GRADE: **A**; PRICE: $30 street; Headbone Interactive; 206/323-0073.

READER SERVICE NO. 737 ■

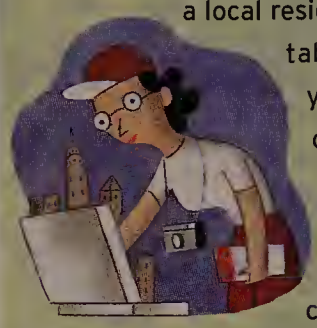
F Y I

- U.S. households with annual incomes from $25,000 to $34,000 that own a PC: 23 percent
- U.S. households with incomes over $60,000 that own a PC: 66 percent

SOURCE: THE CHILDREN'S PARTNERSHIP

KEEPING UP

NOT-SO-VIRTUAL CITIES

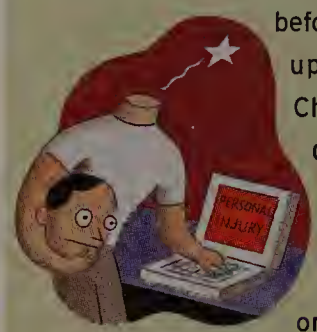


WHETHER YOU'RE a tourist in a new city or a local resident trying to keep tabs on your town, you'll want to check out **CitySearch** (http://www.citysearch.com), a new Web site devoted to comings and goings in major U.S. cities. You'll find everything from local movie and sports team schedules to city council and school board agendas. So far, CitySearch offers comprehensive Web pages for Pasadena, California; Chapel Hill, Durham, and Raleigh, North Carolina; and New York City. The La Crescenta, California-based start-up expects to add nine more U.S. cities soon, including Chicago, Dallas, Minneapolis, and Seattle.

BIG INFO FOR SMALL BUSINESS

NO SINGLE WEB SITE can tell you everything you need to know about marketing your small business, but **AT&T Business Network** (http://www.bnet.att.com) comes close. It includes daily news updates plus links to hundreds of business-related sites—from government resources to specialized publications for marketing, legal, or technology news. The personal business section has links to travel sites, personal-finance Web pages, and job-hunting resources. Right now everything on the site is free, but over time AT&T will begin charging for some services.

THE LOWDOWN ON LAWYERS



WANT TO GET THE SCOOP on a lawyer before you start racking up the hourly fees? Check out the **Martindale-Hubbell directory and attorney locator** (http://www.martindale.com). It's the online version of the well-respected national directory of bar-accredited lawyers. Some listings are bare bones, including only name, address, specialty, and educational background, but others include detailed information about honors, affiliations, and more.

–Roberta Furger

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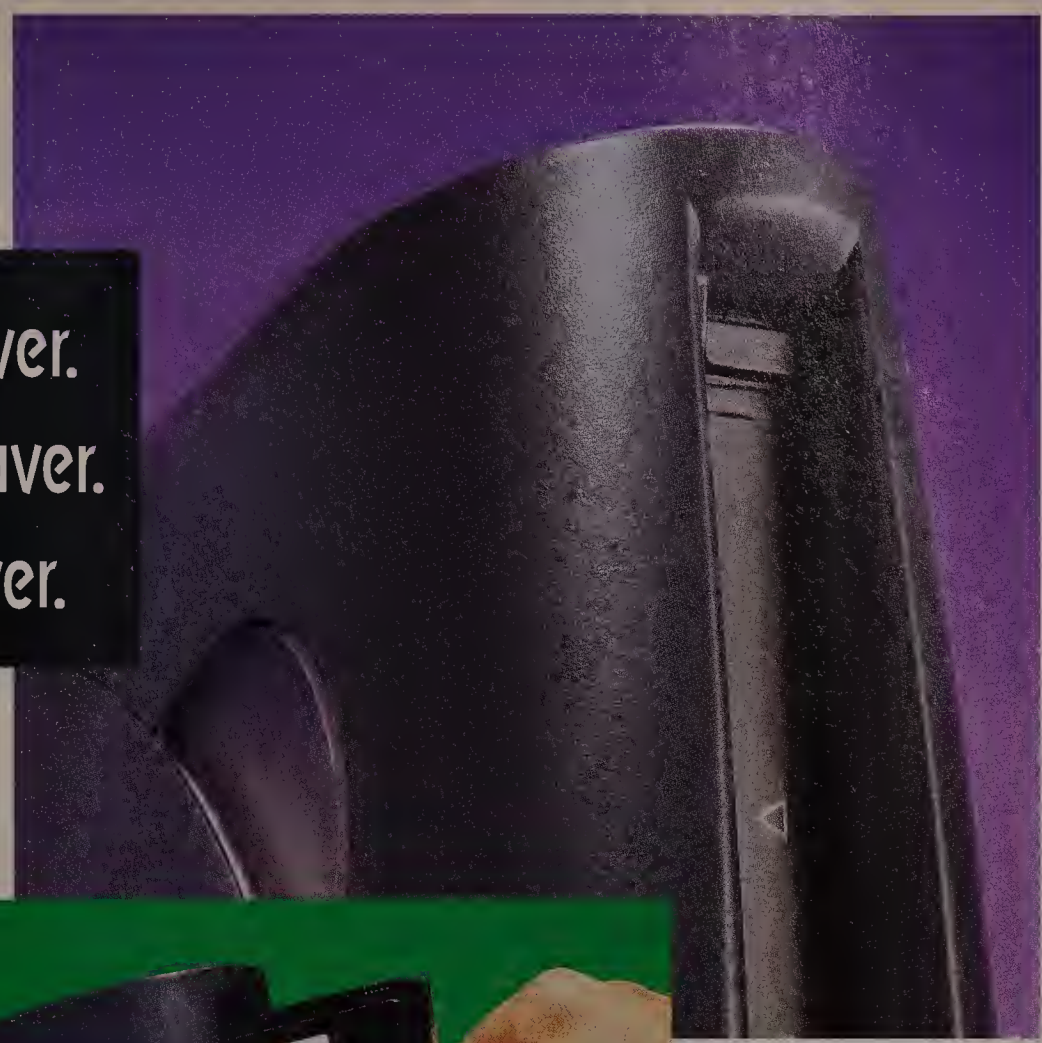
TapeStor drives install in seconds, connecting to the floppy disk controller or parallel port of your IBM compatible PC or workstation. The kit includes everything needed for installation, including a 4-step installation poster. Each TapeStor drive also comes with Tape-It™ for Seagate, a unique drag and drop backup and file management software program. This Win95 compatible program makes your tape drive look just like another disc drive, for easy copying and transfer of files between disc and tape.

Seagate TapeStor drives use industry standard Travan media (the latest in tape storage technology), and are fully compatible with other Travan and QIC-compliant tapes. For more information, contact your local computer retailer, visit our website at www.seagate.com, or call 800-626-6637.

The all-new TapeStor drives from Seagate. Easy to use. Easy to install. Hard to do without.



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Circle 209 on reader service card

PC WORLD

TOP 5 HOME PCs

	SYSTEMS	Street price (8/5/96)	Overall rating	PC World-Bench score	Reliability/ service rating	Setup rating	Comments	Reader service number
1	Hewlett-Packard Pavilion 7130P 800/724-6631 http://www.hp.com	$2348	77	154 good	best/ best	very good	**FEATURES:** P-133, 16MB of RAM, 1.6GB hard disk, 6X CD-ROM drive, 28.8-kbps fax-modem with voice mail and speakerphone, 15-inch monitor, built-in color scanner. **PRO/CON:** Snapshot-size color scanner and image editing software. Very easy setup, great software including Microsoft Encarta, Quicken, and SimCity 2000.	709
2	Micron Home MPC 800/438-3343 http://www.micron.com	$3049	75	215 outstanding	best/ best	good	**FEATURES:** P-200, 32MB of RAM, 1.2GB hard disk, 8X CD-ROM drive, 28.8-kbps fax-modem with voice mail, 17-inch monitor. **PRO/CON:** True power machine for home or home office. Very high price buys blazing speed and a big monitor. Nice software package includes Quicken, Microsoft Encarta, and MechWarrior 2.	710
3	Compaq Presario 4712 800/345-1518 http://www.compaq.com	$2698	75	188 very good	best/ fair	good	**FEATURES:** P-166, 24MB of RAM, 2.5GB hard disk, 6X CD-ROM drive, 33.6-kbps fax-modem with DSVD, voice mail, and speakerphone, 15-inch monitor. **PRO/CON:** Great home office communications center. DSVD allows for simultaneous voice and data connections. Price is a little high. Limited software package.	711
4	Nexar 9000 508/836-8700 http://www.nexr.com	$2299	75	150 good	[1]	satisfactory	**FEATURES:** P-166, 16MB of RAM, 1.2GB hard disk, 8X CD-ROM drive, 28.8-kbps fax-modem with voice mail, 15-inch monitor. **PRO/CON:** Good price. Easy access to the CPU, memory chips, and cache modules and easy hard disk exchange make for quick upgrades. So-so software package and mediocre setup rating.	712
5	Gateway 2000 P5-166 Family PC 800/846-2000 http://www.gw2K.com	$2449	75	199 outstanding	fair/ fair	good	**FEATURES:** P-166, 16MB of RAM, 2.5GB hard disk, 8X CD-ROM drive, 17-inch monitor. **PRO/CON:** Very fast, good price, big hard drive and monitor. Available only through mail order. Gateway's so-so reliability rating and phone-based support make this system one for the confident user.	713

Best Buy http://www.pcworld.com/top5soho All products: 910

HOW WE TEST The overall rating is based on reliability and service (30 percent), price (20 percent), PC WorldBench performance (20 percent), setup (10 percent), compatibility (10 percent), and extra features (10 percent). Reliability and service ratings are based on results of PC World's Reliability and Service survey. [1] Insufficient data.

PROVING JUST HOW UNPREDICTABLE the home PC market has become, this month's Top 5 chart features new PCs from Nexar and Compaq, and a new number one—Hewlett-Packard's Pentium-133–based Pavilion 7130P.

The Pavilion is actually an updated version of a preproduction model we reviewed in June. Besides offering a substantial performance improvement, this HP has the best setup we've ever seen. It offers a built-in scanner for photographs up to 5 by 7 inches, and a great family software package.

Micron reappears on the chart at number two this month with a newly configured version of its popular Home MPC. The machine now sports a Pentium-200 processor and 32MB of RAM, making it the fastest home system ever. Its $3049 price isn't for users on a budget, but if you're looking for a powerful PC that can crunch large spreadsheets or run demanding CD-ROMs, then Micron's Home MPC is the one for you.

THE NEXAR 9000 allows easy upgrades via the removable side panel.

Making its debut in the Top 5 is the Pentium-166 Nexar 9000. Solid performance and a low price of $2299 land it at number four, but what makes the Nexar unique is its easy upgradability. A removable side panel gives you fast access to the clearly marked CPU, memory, and cache modules, and the hard drive is also designed for hassle-free exchange. However, the Nexar gets mediocre marks for its lack of color-coded cables to ease setup.

Two machines return from last month's chart. The third-place Compaq Presario 4712 is a good choice for a home office communications hub. The Pentium-166 unit has 24MB of RAM, a 33.6-kbps modem, and a host of telephony features.

Still holding its own after two months in the Top 5 is the Gateway 2000 P5-166 Family PC. The other systems' more sophisticated features and easier setup dropped the P5-166 to fifth place.

—*Kirk Steers*

Kirk Steers is a contributing editor for PC World. *Testing performed by Ulrike Diehlmann of the PC World Test Center.* ■

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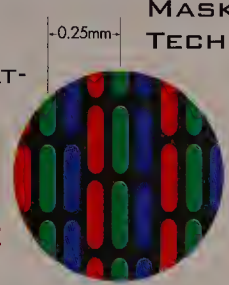

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PC WORLD TOP 10 Monitors

CHIP TIP Juli 1995

ISO

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Best Buy: PC World, Sept 1996

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Circle 127 on reader service card

Cool Tools for Win 95 (and Win 3.x)

EVERYONE LAUGHED. I didn't even think it was possible. But it's true: I finally upgraded to Windows 95. I'm enjoying most of Win 95, but it's not perfect. Fortunately, I found three programs that should have been built into Win 95. (And Win 3.*x* diehards, there are versions for you, too.)

Take Win 95's Explorer. It's better than Win 3.*x*'s File Manager; but sorry, still no cigar. A great substitute is MicroHelp's PowerDesk ExplorerPlus. ExplorerPlus impressed me right away because it can be set up to display multiple drive windows upon loading. And it supplies an amazing array of toolbar buttons—copy to, move, delete, recycle bin, open and tile a new window, DOS window—all customizable with drag and drop.

To peek inside files, simply select one and open an ExplorerPlus viewer pane. There's also a DOS command line, and a drive bar that lets you switch to another drive with a single click.

Another great feature: ExplorerPlus can be configured to emulate keystrokes for the DOS version of Norton Commander or Xtree Pro for Windows. For old DOS and Win 3.*x* hounds like me, this makes the move to Win 95 a lot easier.

Still using Win 3.*x*? Don't fret: There's WizManager Pro, a File Manager add-on written by Mijenix, the same company that created ExplorerPlus for MicroHelp. Though it can't match all of ExplorerPlus's features, it comes close. A time-limited version is available on Mijenix's Web site (http://www.mijenix.com).

When I first installed **ZipFolders,** I was startled. It appeared to **transform** all my **ZIP files** into new folders.

TAKING THE TASKBAR TO TASK

I DIDN'T REALIZE how much better Win 95's Taskbar could be until I loaded MicroHelp's other gem: PowerDesk Toolbar.

This program offers dozens of handy ways to access everyday Win 95 functions. For example, it displays icons of all my printers so I can switch instantly between devices or print files by dragging and dropping them from the desktop. It also monitors resource levels, and provides a DOS command line and one-click access to shutting down the system or changing screen settings. The Toolbar can integrate into Win 95's Taskbar, attach to another screen edge, or float on the desktop.

PowerDesk Toolbar is also infinitely customizable. I took dozens of items that I use regularly—specific applications, key files, folders, and Start menus—and dragged them onto the Toolbar. Voilà! One-click access to everything.

MicroHelp puts PowerDesk Toolbar and ExplorerPlus onto one disk for under $50. Or grab a time-limited evaluation copy of both apps from MicroHelp's Web site (http://www.microhelp.com).

ZIP? YOU'RE ZAPPED

I SAVED THE BEST for last. Is anything more cumbersome than unarchiving ZIP files? Now, that hassle is history, thanks to ZipFolders. Simply put, this program makes a ZIP file act as if it's unzipped: Everything inside a ZIP file becomes as accessible as the contents of any other file on your drive. You can read zipped text files and run apps without decompressing them. When you check for viruses or do a search, ZIP files act just like regular files.

When I installed ZipFolders, I was startled. It appeared to transform all my ZIP files into new folders. Each folder held the contents of the ZIP file and used that file's name. Actually, the ZIP files remained compressed on my hard drive, but the software made them look like folders—kinda like *virtual* folders. ZipFolders works in Win 95, Win 3.*x*, and DOS (from within Windows). A time-limited version is available on Mijenix's Web site.

You probably have some cool Windows 95 tools, too. Tell me all about them at steve_bass@pcworld.com.

PowerDesk ExplorerPlus, PowerDesk Toolbar

$49.95 for both; MicroHelp; 800/777-3322, 770/516-0899, 770/516-1099 (fax); http://www.microhelp.com

READER SERVICE NO. 714

WizManager Pro, ZipFolders

$39.95, $29.95; Mijenix; 800/645-3649, 608/277-1981, 608/277-1971 (fax); http://www.mijenix.com

READER SERVICE NO. 715

Contributing Editor Steve Bass, a licensed marriage and family therapist, is president of the Pasadena IBM Users Group. ■

ILLUSTRATION: GREG CLARKE

PC WORLD MULTIMEDIA EDITION

SOUND ADVICE

The Best Speakers for $200 or Less

For as little as $99, you can find speakers that produce sound to satisfy serious gamers and office audiophiles alike.

BY DIANE MEHTA

WHEN YOU POP QUAKE IN YOUR CD-ROM drive, you want the full effect of Trent Reznor's fantastically creepy soundtrack. Clear, realistic audio makes any multimedia or music CD more enjoyable. PC speaker prices can range up to almost $1000, but for about $200 or less, we found a slew of two- and three-piece sets that produce high-quality sound.

INSIDE

M7 Title Reviews
Two new games re-create Civil War dramas, and two simulations put you behind the wheel in world-class car races. We also take ten other titles for a spin this month.

M10 Hardware Reviews
Heighten your multimedia pleasure: Check out our Top 5 CD-ROM drives and sound boards.

M21 Q&A
Solutions to your multimedia problems.

The smallest, lightest, **brightest** multimedia projector is now an even brighter **choice.**

Turn your bright ideas into brilliance. Introducing the Epson ELP-3300, the world's smallest, lightest and brightest multimedia projector. Now you can make brilliant presentations anytime and anywhere without turning off the lights.

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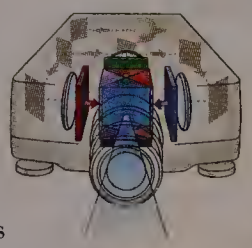

Epson's Prism Technology, and 3 advanced LCD's (not just 1) produce the brightest, high-quality images.

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Extra Care Road Service Program is free while under Epson's one-year limited warranty. Award and nomination given to ELP-3000, the first in the line of Epson projectors with 3 LCD, Prism Technology. © 1996 Epson America, Inc.

Some of the ten systems here use 3-D sound technologies that deepen and widen the audio. They make the screech of your tires and the roar of your engine as you maneuver a hairpin turn in Grand Prix II sound a little too real. Others include subwoofers for thunderous bass effects—perfect for blasting away enemy thugs in Crusader. And if you like to play your Luciano Pavarotti CD while you cruise the Web, some of the high-end units in this roundup may rival your home stereo system's sound. In addition, all the 2- and 3-piece sets reviewed here provide magnetic shielding to avoid interference with your monitor or hard disk.

We hooked up each sound system to a Gateway 2000 PC and played various multimedia games and audio CDs. We paid close attention to ease of use as well as each speaker's footprint and appearance, but were primarily concerned with sound quality and price. Although the three-piece systems (those with a subwoofer) usually produce better sound, that isn't always the case. For example, the two-piece Jazz 3D JS-300 speakers, using NEC's 3-D stereo sound technology, yielded audio comparable to some of the three-piece sets we evaluated. However, the Nakamichi SP3d's two speakers and subwoofer—our Best Buy system—offered the most gut-wrenching, enveloping sound, with Atlantic's, Creative Labs', and Yamaha's systems all following close behind.

When you're shopping, bring your favorite CD to the store, turn up the volume, and fiddle with the controls. Let your ears be the judge.

TWO-PIECE SYSTEMS

AUDIO-TECHNICA MMS557 2-WAY 2-CHANNEL AC POWERED SPEAKERS

Audio Technica MMS557 2-Way 2-Channel AC Powered Speakers

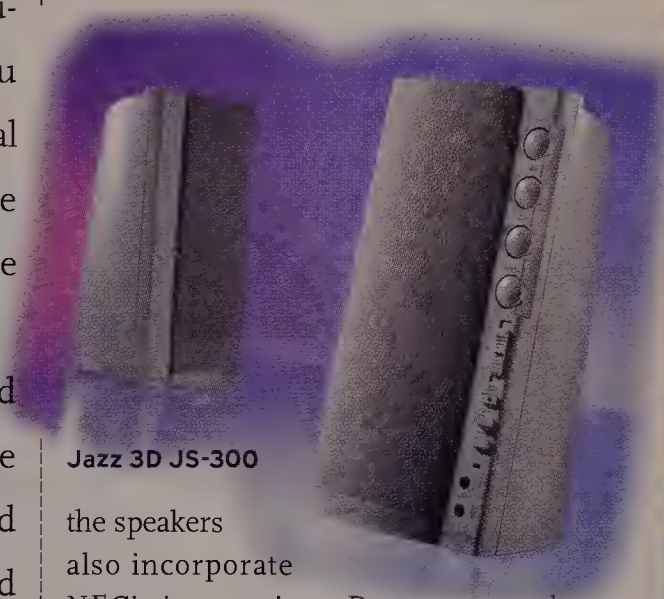
CONSIDER THESE the high end of the low end. Even without a subwoofer, the MMS557's two-way woofer and tweeter produce deep, spacious sounds, albeit not nearly as nuanced and clean as the Nakamichi speakers. The MMS557's speakers are a bit boxy, but their black color and short stands enhance their looks. You don't have to plug them into the wall because they feature battery-free use (they have an internal power supply). They also have a built-in two-channel amplifier. If you need inexpensive, easy-to-use speakers, these are your ticket.

$100 street; Audio-Technica; 330/686-2600

READER SERVICE NO. 774

JAZZ 3D JS-300

WITH AN INNOVATIVE design that provides separate, adjustable 3-D settings for music, theater, and games, Jazz's new speakers let you reset them to the type of audio you're running; the speakers also incorporate NEC's impressive 3-D stereo sound technology. The music setting really highlights the vocals on my Nina Hagen CD; the theater setting yields a wide, balanced sound; and the game selection produces high-intensity, loud audio—perfect for Doom. To keep the design sleek, the bass, treble, and volume controls are inset, so you must rotate them with your thumb instead of twisting them. The Jazz is the best choice for budget-conscious shoppers looking for a two-piece system.



Jazz 3D JS-300

$99 street; Jazz; 818/336-2689

READER SERVICE NO. 775

ROLAND MA-12CP POWERED-SPEAKER SET

HEAVY IN BOTH weight and output, Roland's MA-12CP units produce strong, spacious sound and deep bass tones, so if you like Led Zeppelin or simply want "big sound," these are a good choice. The disadvantage ►

Roland MA-12CP Powered-Speaker Set

is that they weigh 5.2 pounds apiece. The advantage is that each speaker is powered separately, so you can adjust volume, bass, and treble on each, allowing you to highlight bass on one satellite and treble on the other. If you want versatile, heavy-duty speakers with hearty sound quality—and you don't mind paying the high price they command—these are worth putting on your short list.

$199 street; Roland; 213/685-5141

READER SERVICE NO. 776

THREE-PIECE SYSTEMS

ALTEC LANSING ACS45 POWERCUBE MULTIMEDIA SPEAKER SYSTEM

THE THREE-PIECE PowerCube speaker system includes two well-designed satellite cube speakers and a heavy, resonant bass subwoofer for low frequency response. At $99 including the subwoofer, the PowerCube system is a good, cheap buy, but the sound isn't nearly as good as the top sets we tried that cost almost twice as much. The bass adds depth but doesn't make you feel as if the audio is actually surrounding you. The two satellites are sleek, small, and come with detachable stands. Altec Lansing's innovative "electronic volume controls" on the top of the right speaker consist of two buttons that let you adjust the sound level. The bass adjustment, though, is inconveniently located on the back of the subwoofer.

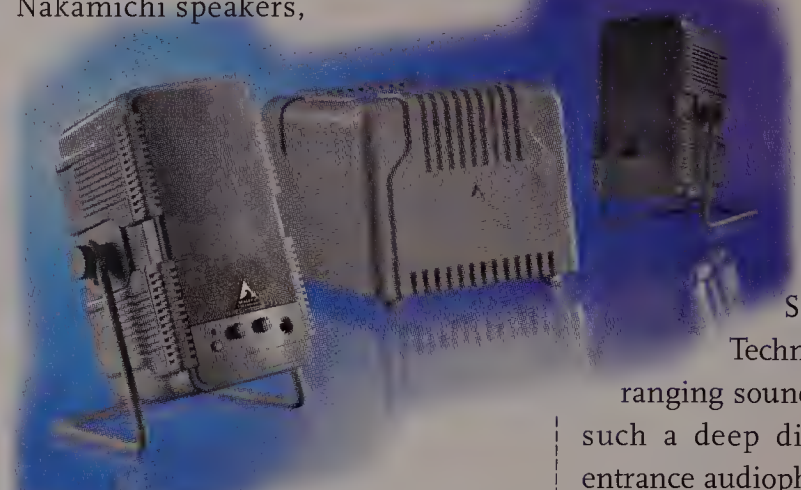
Altec Lansing ACS45 PowerCube Multimedia Speaker System

$99 street; Altec Lansing; 800/648-6663

READER SERVICE NO. 777

ATLANTIC M110 SPEAKERS AND M105 BASS TOASTER SUBWOOFER

WITH SMALL but sturdy satellites and Atlantic's Bass Toaster subwoofer, prepare yourself for a virtual theater of sound. On a par with the Best Buy Nakamichi speakers, this set provides a spacious, enveloping sound that, with the prominent bass, might just make you forget you're working on a computer. When I played Portishead and closed my eyes, the sound was so resonant that I forgot I was at the office until someone asked me to turn the volume down. If you're an avid music listener, you should seriously consider these. The treble adjustment extends the sound quality even more, and overall you get good tonal balance at different volumes.



Atlantic M110 Speakers and M105 Bass Toaster Subwoofer

$200 street; Atlantic Technology; 617/762-6300

READER SERVICE NO. 778

CREATIVE LABS SOUND BLASTER SBS380 SPEAKERS AND SBW500 SUBWOOFER

CREATIVE LABS' NEW Sound Blaster speaker line is sure to give other manufacturers a run for their money. The SBS380 speakers ($99) plus a resonant $99 SBW500 subwoofer emit sound quality comparable to the Nakamichi system. The speakers use Creative Labs' 3D Stereo Enhancement Technology to achieve a wide-ranging sound. The subwoofer adds such a deep dimension that it will entrance audiophiles. Whether I played Itzak Perlman or Massive Attack, these speakers were dynamite. The only drawback is in the design: The bass and treble controls are combined into one knob on the side of the right speaker. Except for the volume button, adjustments may be slightly inconvenient.

Creative Labs Sound Blaster SBS380 speakers and SBW500 subwoofer

$198 street; Creative Labs; 800/998-1000

READER SERVICE NO. 779

SPEAKERS — TWO-PIECE SYSTEMS

FEATURES	Audio-Technica MMS557 2-Way 2-Channel AC Powered Speakers	Jazz 3D JS-300	Roland MA-12CP Powered-Speaker Set
Satellite height x width x depth (inches)	9 x 5.5 x 6	10 x 5 x 5	8.6 x 5.2 x 6.5
Subwoofer height x width x depth (inches)	–	–	–
Separate bass and treble controls	●	●	●
Location of controls			
Volume	front	front	front
Bass	front	front	front
Treble	front	front	front
Claimed watts per channel (satellites/subwoofer)	10/–	14/–	10/–

* Best Buy ● Yes ○ No

LABTEC LCS-2612 GAMER SERIES

THE LABTEC SPEAKERS produce bright, full audio with clear bass and strong highs. Their sound isn't quite up to that of the Nakamichi speakers, but this system well worth the investment. The Labtec satellites come with mounting brackets to attach to your computer, eliminating the tangle of wires typical of free-floating desk speakers. A sleek desk-based subwoofer sits below the right speaker and has controls on the front. If you're into minimalist design and require high-quality sound without spending too much, these are a good choice.

Labtec LCS-2612 Gamer Series

$150 street; Labtec; 360/896-2000

READER SERVICE NO. 780

NAKAMICHI SP3D

THE MERCEDES OF computer speakers, these compact SP3d units have well-defined audio with resonant bass, an impressive frequency range for highs and lows, and "presence" that lets you simulate being at a live performance. The SP3ds use SRS Labs' Sound Retrieval System 3-D stereo technology, producing an enveloping, panoramic sound that surpasses all others. This is the system that has earned the privilege of playing your Mozart and Beethoven CDs. You can attach the satellites to your monitor, change their angles, or leave them on your desk with the subwoofer, which looks a bit like a spaceship. These high-performance units produce sound that's out of this world.

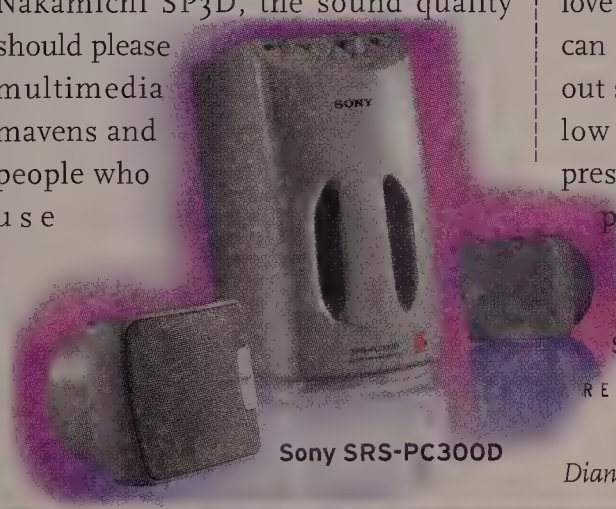
Nakamichi SP3d

$190 street; Nakamichi; 310/538-8150

READER SERVICE NO. 781

SONY SRS-PC300D

THE SONY SRS-PC300D speakers and subwoofer put out spacious audio that won't disappoint demanding users. Although it's not quite on the level of the Nakamichi SP3D, the sound quality should please multimedia mavens and people who use the PC as a stereo substitute. Almost everything sounds good on these units. You can attach the small cube-like satellites to your monitor, which results in fuller sound than if placed on the desktop. The subwoofer has a mixing switch that lets you combine audio from two sources.



Sony SRS-PC300D

$170 street; Sony Electronics; 800/352-7669

READER SERVICE NO. 782

YAMAHA SYSTEM 45

SPORTING TWO off-white rectangular satellites and a subwoofer, Yamaha's speakers are in a league with Nakamichi's (although they do cost a little more). If you're into arcade-quality sound and a physical, high-performance bass, you'll love these. With dual stereo inputs, you can play games or listen to music without switching cables. The subwoofer's low frequency response adds greater presence than the stand-alone satellites provide. The set's available in snazzy black, which should please fashion-conscious multimedia users.

Yamaha System 45

$200 street; Yamaha; 714/522-9011

READER SERVICE NO. 783 ■

Diane Mehta is an associate editor for PC World.

THREE-PIECE SYSTEMS

Altec Lansing ACS45 PowerCube Multimedia Speaker System	Atlantic M110 Speakers and M105 Bass Toaster Subwoofer	Creative Labs Sound Blaster SBS380 speakers and SBW500 subwoofer	Labtec LCS-2612 Gamer Series	Nakamichi SP3d*	Sony SRS-PC300D	Yamaha System 45
4.5 x 4 x 4.5	7 x 4 x 4.5	9 x 4.3 x 5.8	5.5 x 3 x 3.3	5.2 x 3.9 x 6.8	3.8 x 4 x 3.4	9.6 x 3.7 x 6.1
5.5 x 11 x 7	6.6 x 7.1 x 10.2	6.1 x 11.9 x 12.3	5.3 x 3.5 x 6.3	7.5 x 7.9 x 7.9	10.8 x 5.3 x 8.8	7.9 x 11 x 10.2
–	●	○	●	●	–	●
top	front	side	front	front	front	front
back	back of subwoofer	side	front	front	front	front
–	front	side	front	front	–	front
6/20	3/22	10/25	4/12	6/13	12.5/25	10/25

Why pay for cellular phone service if you only want it for emergency use?

The SOS Phone offers a 24-hour call center to connect you with your emergency roadside service, 911 service or family members in the event of an emergency.

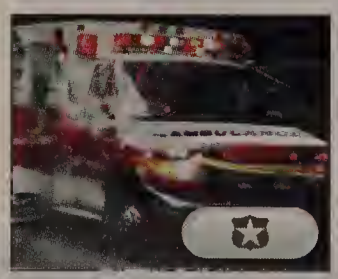
Press the Tow button and your emergency road service will be dispatched to tow your automobile.

To tell you the truth, I am not interested in owning a cellular phone...*except for use in an emergency.* What would I do if my car broke down on the interstate or ran out of gas on some deserted back road? How would I get help? Like most women, I have the safety of my children to consider.

Last month, I inquired about cellular phone service. I was surprised to find out how expensive it was, even for the most basic calling plans! I just couldn't justify spending that much for something I may never need. Then a good friend told about a product she thought would solve my problem. It's the SOS Phone—a cellular phone service designed exclusively for emergency use!

What does it do? With the touch of a button, the SOS Phone will connect me to a roadside emergency service, a 911 service or a trained SOS operator, 24 hours a day. If I ever need help, I know it's just a phone call away.

Emergency assistance. By pressing the "tow" button, I'll be connected with my emergency roadside service provider. Or, if I don't have one, the SOS operator can recommend one to me and dispatch them immediately.



The 911 button will connect you to 911 police or other emergency services, and the call is absolutely free!

The "911" button will connect me to the 911 emergency service in my area—best of all, the call is absolutely free!

Personalized service. Each SOS Phone has a serial number that is recorded at the Call Center, so each time I use my phone, the operators will know that it is me calling, *and will greet me by name.* Plus, my SOS Emergency Record will appear instantly on the computer screen and the operator will connect me with the person or emergency service I need.

Not just for emergencies. If I just want to call home to tell my husband that the kids and I are running late, I can! By pressing the "call" button, I'll reach an operator. When I ask the operator to call home, I'll be connected automatically. And because the Call Center has my list of 10 most-used phone numbers, I don't even have to recite the number!

Great for teens. The SOS Phone is also a great thing to have around for my stepdaughter. I can rest assured that she'll always be able to get in touch with us (or an emergency service) if she needs to.

Cost control. Unlike ordinary cellular phone plans, the SOS Phone doesn't have any minimum usage requirements or any other stipulations that could change the price I expect to pay each month.

Plus, without my password, the only non-emergency calls my stepdaughter can make are to our 10 preset phone numbers. I can even specify a maximum credit limit per month to eliminate the surprise of outrageous monthly bills!

Use the Call button to talk to an SOS operator or be connected to someone on your preset list of numbers.

Try it yourself. I can't begin to tell you how much confidence the SOS Phone has given me and my family. Why not try it yourself? If you don't enjoy its convenience and security, return it within 90 days for a "No Questions Asked" refund. It also comes with a three-year manufacturer's limited repair or replacement warranty.

SOS Phone . . . . . **$99** $12 S&H

12-month service contract required for this price. Requires a one-time non-refundable activation fee of $25 and a monthly charge of $9.95. Calls made on the Call button are billed to your credit card at $1.45 per minute. (That rate includes all local, long-distance, cellular and roaming fees.) For outgoing calls only.

Please mention promotional code **1788-MM-1105.**

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Circle 52 on reader service card

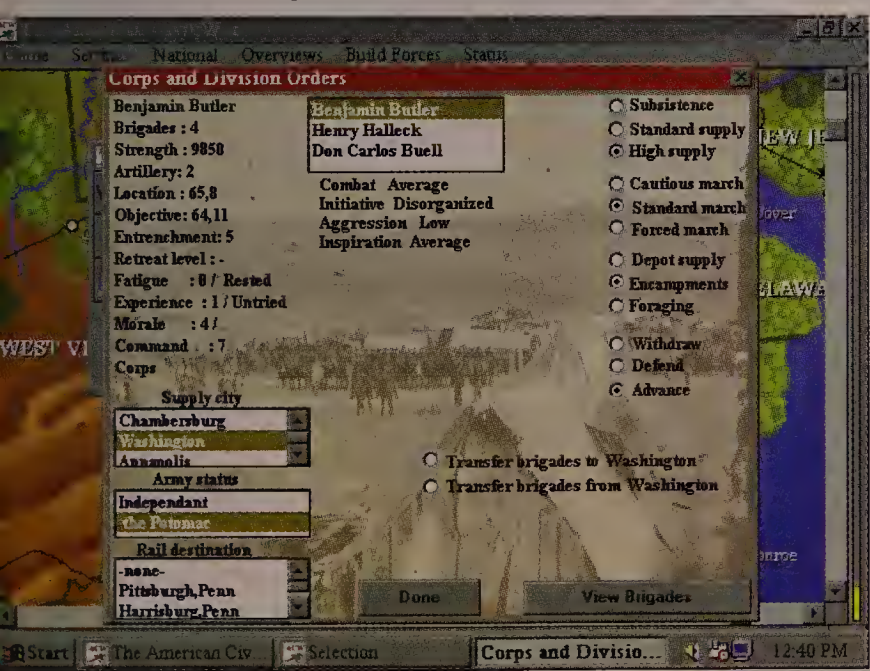
Battle Simulations Bring Civil War to Life

ROBERT E. LEE: CIVIL WAR GENERAL from Sierra Online lets you lead either side in the war.

ENTERTAINMENT

THE LEGACY OF Robert E. Lee, the preeminent Confederate army general, lives on in two compelling CD-ROM battle simulations, **Robert E. Lee: Civil War General** and **American Civil War.**

Robert E. Lee: Civil War General sets a new standard for graphical Civil War presentation, with live-action video reenactments, animated battles, and a beautifully designed interface. The disc captures the emotional toll of the conflict, and the melancholy of the famous general. This captivating strategy game simulates six famous battles and one fictional skirmish involving Lee's Army of Virginia. Also included, but somewhat upstaged by the captivating game play, is a rich, multimedia Civil War reference section.



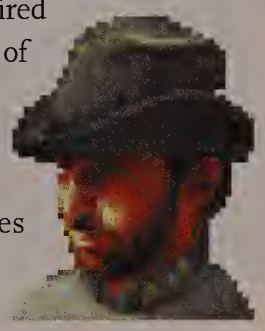
INTERACTIVE MAGIC'S American Civil War features a detailed play system that includes every battle in the conflict.

You lead either the Union Army of the Potomac or the Confederate Army of Virginia, battling a computer or human opponent (via modem) through individual skirmishes or the entire campaign. The game's stunning graphics will

appeal to strategy fans, while Civil War buffs will love the attention to detail. A beautifully rendered terrain map helps you keep your bearings; and unlike with many military sims, an intuitive interface makes it easy to monitor troop strength, health, morale, and firepower.

Sierra Online's Robert E. Lee: Civil War General balances the chesslike strategy of troop deployment with the human side of war. Nightfall on the battlefield is not to be missed, as strife and bloodshed are magically transformed into a peaceful, almost dreamlike scene, complete with crackling campfires and rows of tents where columns of men once stood.

Like Sierra Online's title, Interactive Magic's American Civil War is a battle simulation that allows you to lead either side. It offsets uninspired graphics and a dearth of animation and multimedia features with a realistic, detailed play system that includes every battle in the conflict.



A bundled reference CD-ROM offers useful historical background on the game's numerous political factors, including the possibility of European intervention, the South's position on slavery, and even the capabilities of various generals.

Just as you must plan acquisition of supplies, you must raise troops either by presidential appeal or by financial enticements (conscription is not an option). Capturing cities that possess a significant capacity for manufacturing weapons is strategically important in the game.

American Civil War's interface could be more intuitive; and without a single-screen overhead view, scrolling around the large U.S. terrain map gets tedious. As battle simulations go, this one is not a quick study. But if you're fascinated ▶

by the politics behind the fighting, this disc will reward you with hours of extended play. —*Mark Cohen*

Robert E. Lee: Civil War General

$59.95 list; Sierra Online; 800/326-6654, http://www.sierra.com Grade **A-**

READER SERVICE NO. 761

American Civil War

$36 street; Interactive Magic; 919/461-0722, http://www.imagicgames.com Grade: **B**

READER SERVICE NO. 762

RACE RELATIONS

HAVE YOU EVER FELT the urge to peel out at a stoplight, leaving layers of rubber smoking on the asphalt? Or screech around hairpin turns at breakneck speed without worrying about winding up in the morgue or in jail?

GRAND PRIX II's animation and effects make the racing game a marvel.

Computer racing games like **Grand Prix II** and **IndyCar Racing II** are as close as most of us will ever get to that fantasy. The two sequels perform a thorough tune-up, if not a total overhaul, on their popular predecessors.

Grand Prix II from MicroProse truly has it all, from picture-perfect animation (which lets you use your side mirrors to keep an eye on approaching opponents) to realistic racetrack sound effects, including skids, crashes, even the squeaks of squeegees as pit crews wash your windows.

You join a Formula One team and face pro drivers in a single race or a full season's competition. Not just a marvel to see and hear, Grand Prix II lets you set plenty of race-day options, such as weather settings, car suspension, and type of transmission. Control is so smooth that even a rank amateur who can barely manage to parallel park can be a contender in no time. Keyboard controls work fine, but a steering wheel and pedals would enhance the racing effect.

Sierra Online's IndyCar Racing II takes a different approach. The mechanics at Sierra chose to emphasize realism, making the game's controls so sensitive that only the most experienced drivers can hope to cross the finish line unscathed.

Fortunately, among the game's myriad options is the ability to turn off all car damage. Also, you can adjust race views, get custom tune-ups, and even personalize your car's paint job at a body shop.

While not as impressive graphically as Grand Prix II, IndyCar Racing II more than compensates by demanding advanced driving skill and offering extended play. —*Hugh Foster*

Grand Prix II

$59.95 list; MicroProse; 800/695-4263.

Grade: **A-**

READER SERVICE NO. 763

IndyCar Racing II

$59.95 list; Sierra Online; 800/757-7707.

Grade: **B**

READER SERVICE NO. 764

WAR GAMES FROM A TO...

THERE ARE TWO kinds of war gamers: those who like to carefully recruit troops, build structures, and plan strategies, and those who just like to blow stuff up. If you're one of the latter, then **Z** is the answer to all your pyrotechnic prayers.

Z, a fantastic DOS strategy game set in the distant future, requires you to control and deploy an army of crude cyborg soldiers who prefer chugging six-packs to firing six-shooters.

YOUR ROBOT ARMY fights on five planets.

In this variation on capture the flag, you guide robot units to commandeer vehicles, blow away enemies, and gain control of enemy territory. Your forces fight through 20 levels on five planets with varying terrain and difficulty.

The impressive graphics show amazing attention to detail, from brilliant 3-D explosions complete with shrapnel and flying debris to wildlife that scurries about on the battleground. The music complements the battles perfectly. And best of all, the sound effects and voice-overs that taunt you are decidedly in your face, as in "What are you doing, you moron?"

If you're a hard-core action fan, you've already waited too long to own this title. In my book, Z definitely rates an A. —*Shane Mooney*

Z'S CYBORGS prefer brew to battle.

Z

$54.95 list; Virgin Interactive; 800/874-4607.

Grade: **A**

READER SERVICE NO. 765 ▶

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HELLBENDER HATH NO FURY

BEEN THERE, DONE THAT. That's how I felt after playing Microsoft's new Hellbender. Don't get me wrong, this sequel to Fury3 is a fun 3-D action game—just not the most original to come along.

Microsoft could have called it Fury Direct for its support of the new DirectX technologies and its similarity to Fury3. **Hellbender** supports Direct3D, which should make for even better graphics if your system sports one of the new 3-D accelerators, though I couldn't get a beta copy of the disc to sense my Matrox Millennium's Direct3D support.

Since the days of Fury3, when you battled Bions for the future of the world, you've retired as a fighter pilot. But now the supposedly vanquished enemy Bions suddenly return—with a vengeance. They take out nearly all your pilots in a well-executed opening sequence, leaving nothing but little old you standing between the ruthless Bions and the planet's defenseless citizenry. You emerge from retirement quickly to swoop and twist through seven worlds of aboveground and underground action to eliminate the enemy. There's plenty of joystick jerking throughout to keep you busy.

HELLBENDER, THE SEQUEL to Fury3, launches fresh waves of ruthless Bions.

The graphics are fine, but the game's combat gets repetitious pretty quickly. Hellbender supports the usual multiple views, and Sidewinder Pro owners will love its support of all the joystick's features.

But why bother to pay for this shooter when you can download a fully playable demo for free? If you can stand the 10.5MB demo size (13MB if you don't have DirectX 2.0), try downloading it from its page within the Microsoft Web site (http://www.microsoft.com/games/hellbender) before resorting to shelling out the 45 bucks. —*Ean Houts*

Hellbender

$45 street; Microsoft; 800/426-9400. Grade: **C**

READER SERVICE NO. 766

MECHWARRIOR II REDUX

IN A STRANGE TWIST, MechWarrior enthusiasts now have a year-old DOS game released for Windows 95, and a year-old Windows 95 game released for

PC WORLD TOP 5 CD-ROM DRIVES

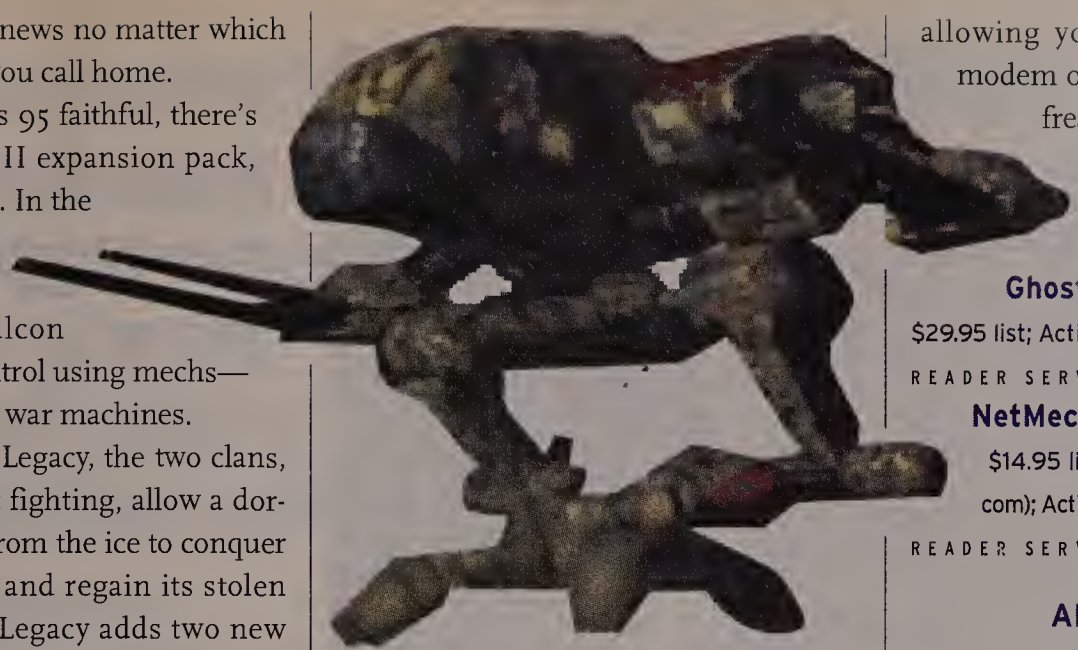
	CD-ROM DRIVES	Month tested	Street price (8/29/96)	Overall rating	Multimedia performance score	Comments	Reader service number
1	Sony CSD-880E 800/352-7669 http://www.sel.sony.com/SEL/ccpg	Oct 96	$140	90	79	**FEATURES:** 8X internal drive; Enhanced IDE; tray-feed mechanism with clips for side-mounted use; adapter card. **PRO/CON:** Good overall performance, reasonable price, generous daily and weekend support, large 256K buffer; no bundled software, no toll-free support.	689
2	Plextor 8Plex 800/886-3935	Aug 96	$309	90	90	**FEATURES:** 8X internal drive; SCSI bus; caddy-feed mechanism; driver support for Windows 3.1, 95, and NT, and OS/2 and Mac. **PRO/CON:** Fastest drive tested, two-year warranty, solid design; expensive, SCSI card not included, no weekend support.	690
3	Teac CD-58E 8X CD-ROM Drive Kit 213/726-0303	Aug 96	$149	89	84	**FEATURES:** NT drivers added; 8X internal drive; Enhanced IDE; tray-feed mechanism with clips for side-mounted use. **PRO/CON:** Strong performer, reasonable price; no software bundle, limited 128K buffer, no Mac or OS/2 drivers, no weekend support, no toll-free support.	691
4	NEC MultiSpin 6V 800/632-4636 http://www.nec.com	Aug 96	$99	87	65	**FEATURES:** 6X internal drive; Enhanced IDE; tray-feed mechanism with clips for side-mounted operation; includes adapter card and cables for Sound Blaster card. **PRO/CON:** Inexpensive, toll-free phone support; slowest performance in Top 5, no software bundle, no weekend support.	692
5	GoldStar GCD-R580B 800/243-0000 http://www.goldstar.com	Aug 96	$160	87	77	**FEATURES:** 8X internal drive; Enhanced IDE; tray-feed mechanism with clips for side-mounted operation; driver support for Windows 3.1, 95, and NT, and OS/2. **PRO/CON:** 11-hour weekday toll-free support, generous 256K buffer; no weekend support, no software bundle, no Mac drivers.	693
						All products:	907

DESPITE A WHOPPING $90 price drop this month, the Plextor 8Plex fell from its perch at the top of the chart. Sony's CSD-880E captured the number one spot thanks to its $50 price cut to $140. The top two drives are neck and neck overall, though, with neither unit running far enough ahead to warrant a Best Buy. Meanwhile, Teac also lowered the price of its drive by $50, so the CD-58E moved into third place. This month we tested NEC's new 8X drive, the MultiSpin 8V CD-ROM Reader. Although it was faster than NEC's 6V in most benchmarks, the 8V ran significantly slower than the 6V in the CD-Tach throughput test and lagged in the PhotoLab test. At $149, it also costs $50 more than the 6V. ■

HOW WE TEST All drives are tested on a Gateway 2000 P5-166XL with 16MB of RAM and Windows 95. At 1024 by 768 at 256 colors, we run Macromedia Director 5.0 I/O benchmark, Microsoft Encarta 96 script, PowerFinder PhoneDisc 96 timed name search, and MindScape CyberSpeed game installation. We also run a 98-image slide show in Corel PhotoLab and run the CD-Tach low-level CD-ROM benchmark utility. The overall rating is based on performance (40 percent), features (30 percent), price (20 percent), and support (10 percent). For all ratings, higher is better. Data based on tests designed and conducted by the PC World Test Center. All rights reserved.

DOS. That's good news no matter which operating system you call home.

For the Windows 95 faithful, there's the MechWarrior II expansion pack, **Ghost Bear's Legacy**. In the original MechWarrior II, competing Wolf and Jade Falcon clans battle for control using mechs—immense, walking war machines.



In Ghost Bear's Legacy, the two clans, weak from all that fighting, allow a dormant clan to rise from the ice to conquer the Inner Sphere and regain its stolen genetic heritage. Legacy adds two new environments, Snow/Ice and Underwater, as well as 14 new mechs and 6 new weapons. In addition, most of the 12 missions seem more substantial than those found in MechWarrior II.

Legacy's main drawback: It forces you to start again as a rookie in a new clan. I'd prefer more missions for the original clans starting somewhere in the middle. But some of these tough missions are well thought out and involve strategy as opposed to having you just wander around blowing away any mech unfortunate enough to cross your path.

The multiplayer component of MechWarrior II, **NetMech**, was previously available only for Windows. DOS diehards had to wait a year for a version they could play, but their patience is well rewarded. NetMech offers more than a dozen missions, allowing you to battle it out over a modem or against seven other mech freaks over a network. You can download NetMech free at Activision's Web site.

—Shane Mooney

Ghost Bear's Legacy

$29.95 list; Activision; 800/477-3650. Grade: **B**

READER SERVICE NO. 767

NetMech

$14.95 list (free at http://www.activision.com); Activision; 800/477-3650. Grade: **B**

READER SERVICE NO. 768

ALL ABOUT EVE

PETER GABRIEL and friends offer a chance to reclaim a bit of paved-over paradise in the CD-ROM game **Eve**. But this paradise should have stayed lost.

Eve, a primordial music-and-art adventure, is pretentious beyond belief. The disc blends Gabriel's music with artwork by four international figures (Yayoi Kusama, Helen Chadwick, Cathy de Monchaux, and Nils-Udo). ►

PC WORLD

TOP 5 SOUND BOARDS

	SOUND BOARDS	Month tested	Street price (8/1/96)	Overall rating	Audio score	Comments	Reader service number
1	Creative Labs Sound Blaster AWE32 PnP 800/998-5227 http://www.creativelabs.com	June 96	$250	92	92	**FEATURES:** Plug and Play; 512K of RAM expandable to 28MB for downloadable MIDI sounds; DSP for MIDI effects; Sound Font editing software. **PRO/CON:** Top-quality wavetable sound, flexible MIDI composition software, trouble-free installation, good frequency response; noisy microphone.	694
2	CrystaLake Model 110 503/222-2603 http://www.crystalake.com	Aug 96	$169	92	87	**FEATURES:** Plug and Play; 3-D sound with adjustable center, fill, and effect depth; stereo microphone input. **PRO/CON:** High-quality wavetable MIDI sound, realistic 3-D sound effects, good frequency response, low price, three-year warranty; poor cross-talk figures, no reverb or chorus.	695
3	CrystaLake Model 140 503/222-2603 http://www.crystalake.com	June 96	$229	92	87	**FEATURES:** $40 price drop; Plug and Play; 3-D sound with adjustable center, fill, and effect depth, reverb and chorus; stereo microphone input. **PRO/CON:** Great wavetable MIDI sound, realistic 3-D sound effects, low noise, good frequency response, three-year warranty; poor cross-talk figures.	696
4	Creative Labs Sound Blaster 32 800/998-5227 http://www.creativelabs.com	June 96	$149	92	90	**FEATURES:** Plug and Play; OK of RAM expandable to 28MB for downloadable MIDI sounds. **PRO/CON:** Top-quality wavetable sound, good frequency response, low price, trouble-free installation; poor frequency response on microphone input.	697
5	Advanced Gravis UltraSound Plug & Play Pro 800/663-8558 http://www.gravis.com	May 96	$199	89	85	**FEATURES:** Plug and Play; 512K of RAM upgradable to 8MB. **PRO/CON:** Excellent audio performance, good microphone input, professional-grade wave editing and MIDI software, affordable price, easy installation; mediocre MIDI sound, awkward procedures for switching game and MIDI modes in DOS.	698
						All products:	908

NO CARD CAPTURED a Best Buy, but the top four contenders all deserve a close look. The Sound Blaster AWE32 PnP, Creative Labs' best sound board, continues to outshine all comers, with the richest features in the group. However, only a fraction of a point separates it from the fourth-place board overall. This month we tested Core Dynamics' DynaSonix Pro. Its outstanding feature, a ten-band graphic equalizer utility, lets you adjust different audio frequencies to your tastes. The board also includes SRS surround sound with adjustable level and center fill, and an extra output for optional rear speakers. Still, the DynaSonix managed only a ninth-place ranking, mainly due to its unexceptional audio test results. ■

HOW WE TEST All sound boards are tested on an Audio Precision System Two audio test set to determine their frequency response, cross talk, noise, distortion, and other audio characteristics. We judge each board's MIDI (Musical Instrument Digital Interface) and wave audio quality by comparing sample sounds against original source material on digital audio tape. The overall rating is based on the following weighting of factors: performance (40 percent), features (25 percent), price (25 percent), and support (10 percent). For all ratings, higher is better. Data based on tests designed and conducted by Liberman Sound.

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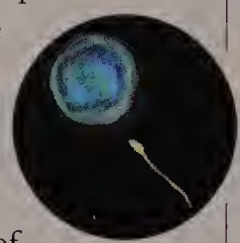
PETER GABRIEL'S EVE CD-ROM launches you on a quest to return Earth to paradise.

The game begins with a scene in which you maneuver a sperm into a ripe ovum. You then travel through similar, mysterious portals from one evolving landscape to another. Eventually, if you're lucky, you'll find Eve (who disappears shortly after the game begins) so you can save the land from its muddy state and restore the good earth.



To reopen the gates of paradise, you must wend your way through various locales, such as the Human Relations Room, that contain hidden clues and puzzles. At stops along the way, you bump into artists, writers, teachers, and scientists who offer insights into the nature of love.

If you're a Gabriel fan, you'll enjoy the pulsing, minimalist music; if not, you might find the soundtrack soporific. Fortunately, once you've completed the puzzles, you can break the monotony by creating your own musical performances with bits of Gabriel's songs; then you can combine these with the game's videos to form digital extravaganzas.

While the artwork is exquisite and the panoramic view of the evolving world breathtaking, the game moves at the pace of evolution—very slowly. Devotees of Gabriel and some of the featured artists might like the disc. But others will find this game about paradise to be less than idyllic. —*Stacey Miller*

Eve

$39.95 list; Starwave; 800/457-8646. Grade: **D**

READER SERVICE NO. 769

ANARCHY BUSTERS

IT'S THE DISTANT future, and human society has disintegrated into violent factions. In **Shellshock**, a tank simulation with attitude, you belong to a ragtag inner-city gang armed with an M13 Predator battle tank. Your mission: Eliminate anarchy on a planet gone mad and restore world order.

As combat action games go, Shellshock is standard fare. The goal throughout 25 levels is to eliminate bad guys, rescue hostages, and pay attention to what your boss says—not exactly groundbreaking stuff. In between levels, you can talk to fellow gang members, although the conversations serve little purpose, and the inner-city dialects sound like they're spoken by B-actors in a sound booth.

Play is fast, but the graphics resemble those in Wolfenstein. That would be fine if this were 1995, but today I expect a sim to offer better graphics than last year's shareware. Ironically, Shellshock is most rewarding when you're killed in action. In a memorial sequence, your comrades create a large graffiti mural in your honor, all to the driving rhythm of a hip-hop beat. San Francisco 49er William Floyd, a.k.a. Bar None, supplies the music that resonates throughout the game. A multiplayer option lets you battle up to eight of your friends.

Overall, Shellshock is an inadequate attempt at a tank simulation. After only a few levels of play, you'll find it hard to sustain any excitement; and completing all 25 levels seems utterly pointless. Even with the hip-hop soundtrack, Shellshock rings hollow. —*Matthew Sanner*

Shellshock

$49.95 list; Eidos Interactive; 415/616-2022. Grade: **D**

READER SERVICE NO. 770

REFERENCE

TOPS IN HOPS

DO YOU HAVE a head for beer? Then let brewmaster Michael Jackson's **World Beer Hunter** lead you to some of the finest specimens known to modern civilization. ▶

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And if you look at the bottom of this page, you'll find a computer retailer who's got Yamaha multimedia speakers. You've got to go get them.

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Circle 258 on reader service card

Like Discovery Channel's first Beer Hunter disc, which focused on U.S. brews, this authoritative guide overflows with insights into the rich cultural heritage of beers and breweries. Interactive maps, audio clips, and videos hop with details about more than 300 beers, including such exotic beverages as Gueuze Girardin (a world-class mix of apple, sherry, hay, and wood flavors).

WORLD BEER HUNTER profiles over 300 brews and 400 breweries around the globe.

You can sample descriptions of aperitif beers, dessert brews, and nightcaps; browse Jackson's recommendations for the perfect accompaniments to fine meals; and then note your preferences and comments in a virtual Personal Pub. You can also drop by Jackson's Web site (http://www.beerhunter.com), which offers listings of beer festivals and related events, articles about brewing, a bulletin board, and other features that serious beer lovers should enjoy.

Once again, Jackson gives both obscure and renowned beers the respect others reserve for fine wines and brandies. The only things missing are foam on your disk drive and the aroma of barley malt wafting from your monitor. —*Steve Bennett*

World Beer Hunter

$40 street; Discovery Channel Multimedia; 800/678-3343, http://www.discovery.com

Grade: **B+**

READER SERVICE NO. 771

SHALLOW EXPLORATION

FOR ITS 150TH anniversary, the Smithsonian Institution assembled a touring exhibition of some 300 objects from its 16 museums. As a gift-shop memento of this collection, **150 Years of America's Smithsonian** is okay, but it fails as either a proxy museum experience or an in-depth information resource.

The CD-ROM offers a single, magnifiable slide of each specimen—no 3-D walk-around views and no multiple slides showing the object from different perspectives. Color reproduction is poor: The text accompanying a photo of azurite remarks on "the intense blue of this specimen," but you see a crystal of murky indigo. Inset color videos look muddy and sometimes ▶

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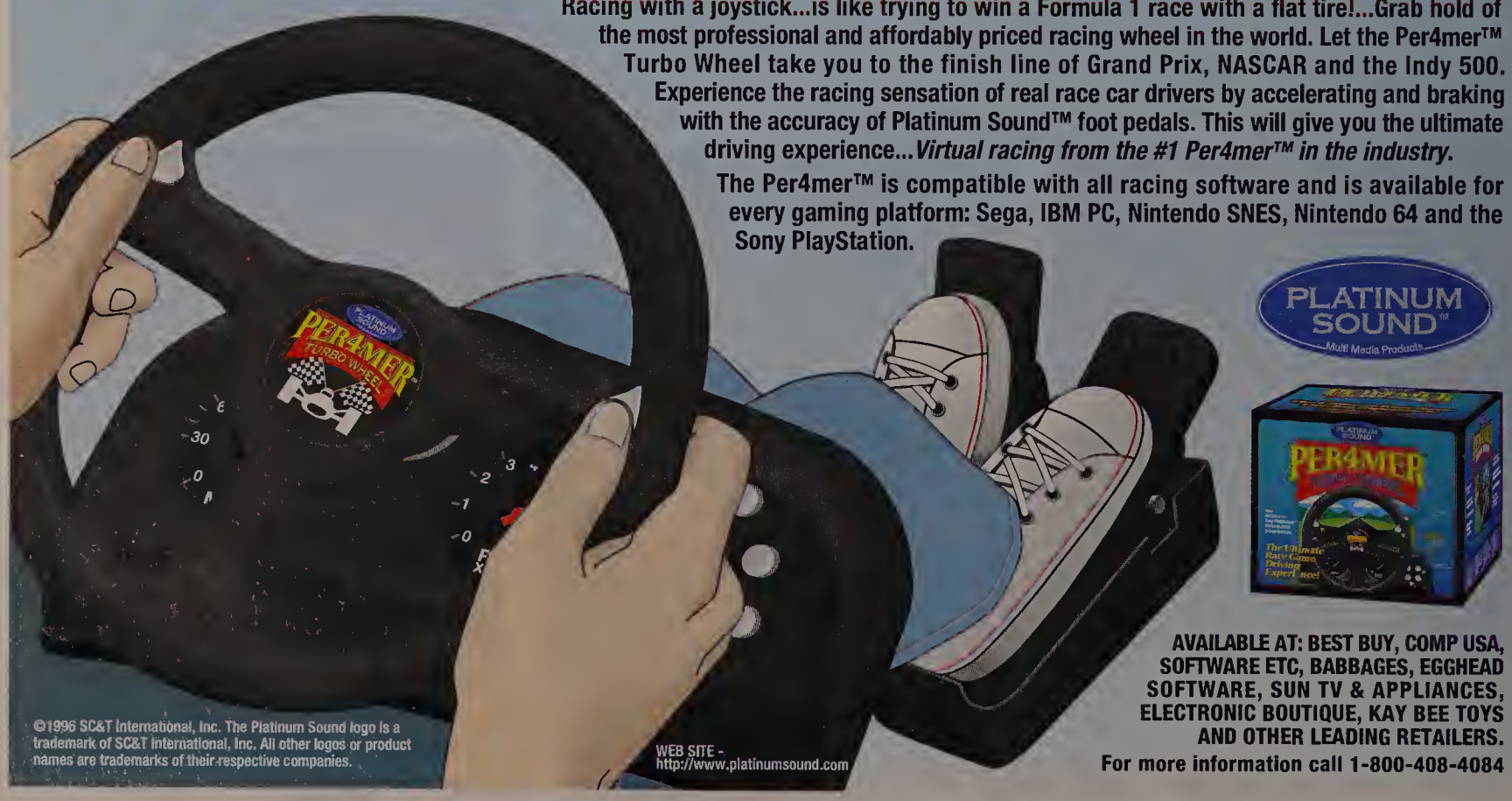

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IN ADVENTURE TRAVEL's simple interface, you click on a camcorder to view videos.

jerky on a Pentium-90, and audio clips are disappointingly sparse.

The disc augments the visual displays with brief, sloppily written, unreliable text and narrations. A discussion of the Mesozoic Era implies that sharks emerged later in geological history than dinosaurs, though the first sharks existed millions of years before the first dinosaurs. A section on art called "An American Vision" concludes with works by two European sculptors—Auguste Rodin and Henry Moore—without explanation.

For $40, you should be able to buy a coffee-table book with excellent color photographs and thorough, well-informed text. A comparably priced CD-ROM with inferior graphics, meager multimedia components, and inaccurate text is no bargain. —*Steven Gray*

150 Years of America's Smithsonian

$39.95 list; Macmillan Digital U.S.A.; 800/910-0099. Grade: **C-**

READER SERVICE NO. 772

THE VIRTUAL EXPLORER

ARMCHAIR EXPLORERS be warned: **The Ultimate Guide to Adventure Travel** may not appeal to the faint of heart. The disc's 130 adventures include trekking, mountaineering, and white-water rafting in remote, unexplored regions of the world.

The CD-ROM contains interactive maps and breathtaking videos and photos that might prod you toward an Indiana Jones–style vacation. And if you're really serious, you can preview a trip on the disc, and then book it with Mountain Travel-Sobek, the firm that launched the adventure travel industry, via the company's Web site (http://www.mtsobek.com/mts).

You select various types of adventures according to activity, skills required, cost, continent you want to visit, and so on. As you take virtual excursions, you can jot down your observations in a handy electronic notebook.

Clever icons simplify your travels around the disc. To get help, you click on a first-aid kit. To go online, you click on a photo of a laptop computer (Adventure Travel lets you set up an Internet account with Earthlink when you install the CD-ROM). To view videos of trips, treks, cultures, and so on, click on a camcorder.

Who knows, you might just be inspired to book that trip of your dreams and release the explorer within. —*Steve Bennett*

The Ultimate Guide to Adventure Travel

$40 list; Graphix Zone; 800/828-3838; http://www.gzone.com Grade: **B+**

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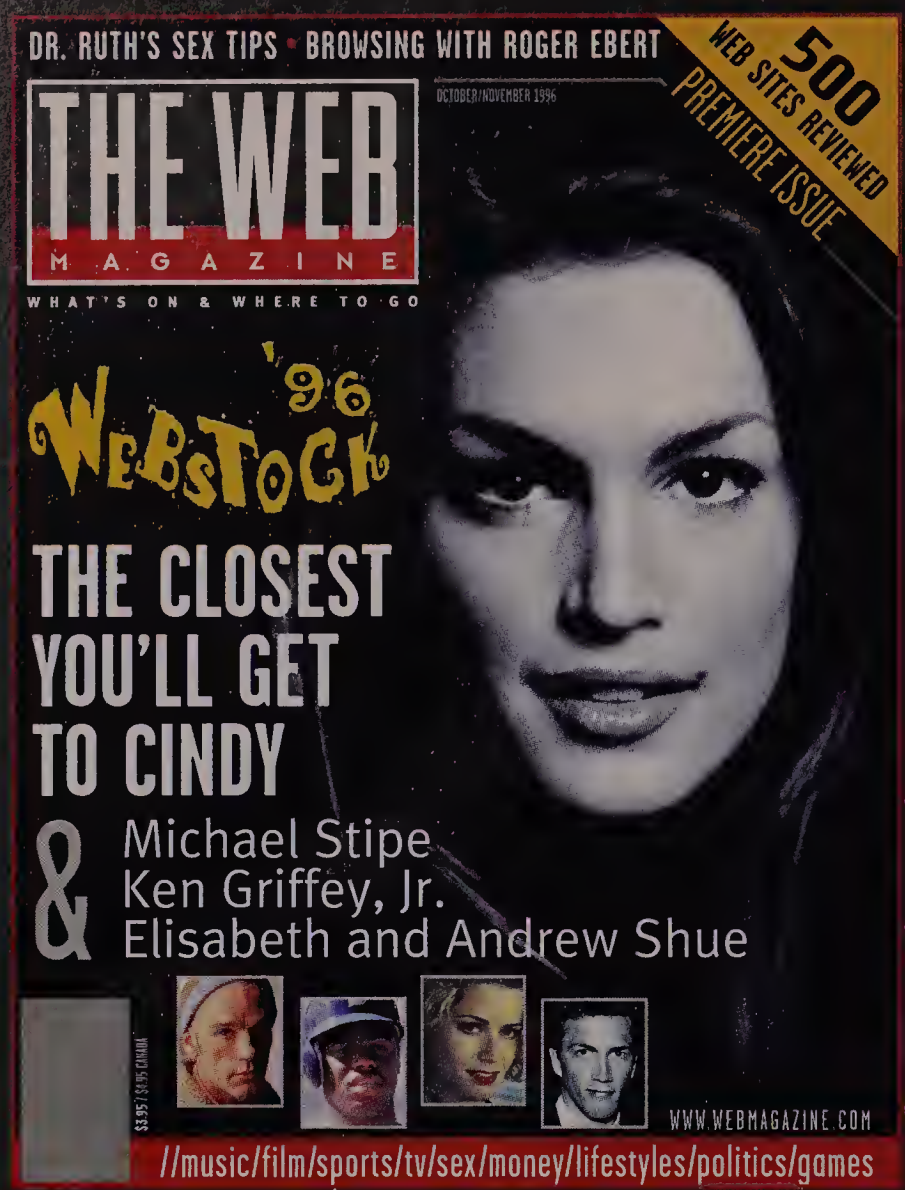

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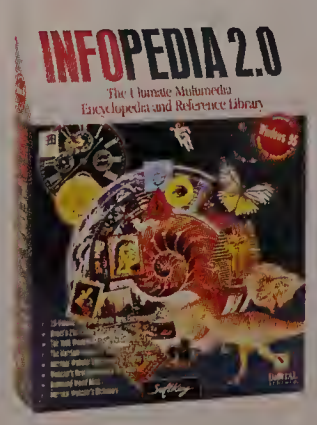

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Circle 130 on reader service card

Does 6X CD-ROM Plus 4X CD-R Equal Disaster?

BY PATRICK MARSHALL AND TOM MARSHALL

I JUST PURCHASED a Pentium-166 computer and want to add a CD-Recordable drive. However, I already have a 6X CD-ROM drive and am worried that it may conflict with the 4X-read/2X-write Sony Spressa CD-R drive that I want to buy. Will the difference in speed between the CD-R and CD-ROM drives cause a problem?

Billy Hennecke, Internet

YOU SHOULDN'T HAVE ANY conflicts if you add a CD-Recordable drive. The Sony Spressa is a SCSI device, and you can daisy-chain up to seven different SCSI devices—including other CD drives—from the same controller card. Just remember that the Spressa requires a bus-mastering SCSI adapter, like the Adaptec 1542 model. Such adapters differ from other controllers in that they have their own processor on board, so they offload the I/O work from the computer's CPU. This is much more efficient on the SCSI bus—drives that don't use a bus-mastering card will take a performance hit.

SEEING SPOTS

A DISCOLORED SPOT recently appeared on the upper left corner of my monitor. A similar effect on my television disappears when I press the TV's degauss button. However, my monitor has no such feature. What can I do?

Michael Haproff, Internet

JUST BECAUSE YOU DON'T see a button doesn't mean your monitor doesn't degauss (a degausser, or demagnetizer, neutralizes a magnetic field). Many new monitors automatically degauss when they're turned on. Your monitor's manual will give you this information.

If your monitor doesn't have a built-in degaussing feature, you can use an external degausser. Those $15 tape-head degaussers you see in record stores might work, but you may have to go to an electronics store and buy a TV degaussing coil. Either way, all you have to do is hold the degausser up to your display. If that doesn't work, you may have defective or damaged phosphors in the screen, in which case you'll have to replace the monitor—or live with the bad spot.

Give Your Presentation a Zippier Pace

IF THE COMMAND BUTTONS you've customized in your Authorware multimedia presentation respond too slowly when you place your mouse pointer over a button, it's because the buttons are on the same layer as the other multimedia elements. To solve the problem, you must put the buttons on a higher layer. Do this by placing the Interaction icon the buttons are attached to in any layer higher than the default, or background, layer—which is called 0. From Authorware's main screen, select the *Interaction* icon and click the *Effects* option in the Attributes menu. Then insert the desired layer number in the layer field. The higher the number, the closer to the "front" the button will be. Also, make sure the buttons use the same palette as your Authorware piece.

K. Stabler, Montgomery, Alabama

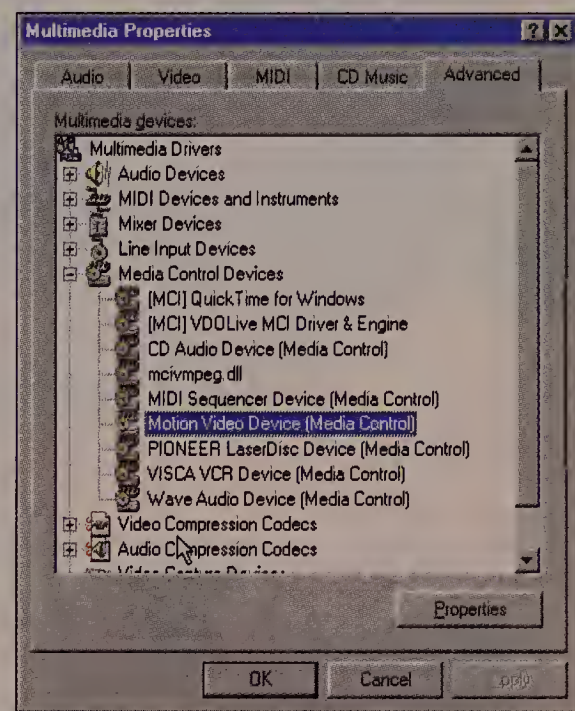
IF YOU MOVE THE BUTTONS in your presentation to a layer higher than the other components', you'll get much better performance.

VIDEO

GET .AVIs UP AND RUNNING

I RECENTLY DOWNLOADED a 27MB ZIP file from the Internet. After I unzipped the file, I found that it contained five .avi files. When I try to play any of them I get an error message in the video window: 'Video not available. Cannot find 'vids.ULTI' decompressor'. How can I get the .avi files to run?

Michael Koszenski, Lexington, Kentucky



WINDOWS 95 MAKES IT EASY to find out what types of media control devices you already have installed.

JUDGING FROM THE error message, two scenarios are likely: Either you don't have the right video decompression files, or the files you have are corrupt. You can reinstall support for video compression and decompression in Windows 3.1 and Windows 95 by following these steps:

1. In Windows 3.1, open the system.ini ►

file in an ASCII text editor (make a backup copy first, in case anything goes wrong). You may want to use Windows' Notepad, located in the Accessories Group of the Startup menu.

2. Next, go to the system.ini [Drivers] section and jot down the names of files you see listed that begin with vidc and end with dll. Then in DOS, delete the files that you just noted. For example, if you find the line vidc.cvid=ulti.dll in system.ini, delete the file ulti.dll. Then delete all lines in the [Drivers] section of system.ini that begin with vidc.

3. Run the Windows setup program again to reinstall the drivers.

For Windows 95, follow these steps:

1. First, launch the Control Panel, then open the *Add/Remove Programs* utility. Click the *Windows Setup* tab, and select *Multimedia*, then *Details*.

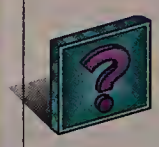
2. Next, click the *Video Compression* check box in order to deselect it, and then click *OK*. Reboot your computer, and repeat the first two steps.

3. Click the *Video Compression* check box to select it, then *OK*. Reboot the PC again.

If you still find yourself unable to run the .avi files, double-click the *Multimedia* icon in the Control Panel and select the *Advanced* tab. Then double-click *Media Control Devices* and then the *Motion Video Device* item in the list that appears, and make certain that *Use this Media Control device* is selected.

If you still can't run the .avi files, they may have been compressed with a third-party program that Windows doesn't support. In that case, you'll have to get the appropriate driver or compression/decompression utility (codec), and install it. Check the site from which you downloaded the .avi files for any information about the codec.

LIVE FROM THE INTERNET



HOW CAN I VIEW live video from the Internet? I currently use the NCSA Mosaic browser.

John Havercroft, Internet

YOU WILL NEED TO USE a video decoder. For television-quality video (approximately 30 frames per second), data transfer requires a speed of about 27 megabits per second, which is 1000 times faster than most analog modems. So you'll have to receive compressed data and then decompress it before you can view the video.

There are several video compression technologies that will stream the file, allowing you to view the video as you download it. The most popular are VDOnet's VDOLive and Xing Technology's StreamWorks. Both products work with most Web browsers, including NCSA Mosaic.

The snag is that video compression/decompression isn't standardized in the industry, so if a site offers a video that's compressed with, say, VDOLive, you'll need the VDOLive client on your computer to view it. In most cases, you can download the client software from the site that's broadcasting the video.

Another related snag: Even with compression, standard copper telephone lines

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Designed for Microsoft Windows 95

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Circle 216 on reader service card

can't deliver the data fast enough for smooth video. An ISDN connection and modem will transfer data about four times faster than a 33.6-kbps modem on a normal phone line, but even that's on the slow side for video. At 1.54 mbps, a high-speed T1 line offers much better performance but is far too expensive for most individuals. In the next few years, cable modems promise to ease the bandwidth crunch, since they will offer speeds of up to 3 mbps.

AUDIO

RESTORE VOLUME LEVEL

I'VE BEEN HAVING some problems with my Sound Blaster 16 sound card. When I start Windows 3.1, the volume automatically drops, which can be annoying. How can I fix this problem?

Chris Siska, Internet

WINDOWS 3.1 WON'T LET you adjust sound levels, but your Sound Blaster 16's Creative Mixer utility can do the job. There are actually two mixers—one for DOS and one for Windows. Using each, you can set different sound levels for DOS and for Windows.

To use the Windows Mixer, locate the *Mixer* icon in the Sound Blaster program group and double-click it. The utility that pops up offers a bank of sliders for adjusting not only the overall volume, but also the amount of bass and treble for your speakers and microphone. The new settings will be saved automatically when you exit the Mixer.

SOUND OF SILENCE

MY SOUND CARD can play some of the sound files that come with Windows, but not all of them. For example, I can play canyon.mid, but whenever I choose the Sound icon from the Control Panel, nothing seems to work.

Brad Austin,
Martha's Vineyard, Massachusetts

YOU DON'T SAY WHICH sound card you're using, and whether it's Sound Blaster compatible, which makes the problem tough to diagnose. But it may be due to one of two causes.

Assuming that you have a Sound Blaster–compatible card, your sound card drivers may not be installed properly. Remember that MIDI files, such as canyon.mid, are in a different format than the .wav files you find in the Sound utility, and they require different drivers. Try reinstalling the software that came with your card.

Alternatively, it's likely your card is a MIDI synthesizer, not a standard Sound Blaster–compatible sound card capable of playing .wav audio files. Check your sound board documentation to determine if it does play .wav files.

Patrick Marshall is research manager for InfoWorld's *Reviews and Testing department. Tom Marshall is a freelance writer specializing in computer technology.* Multimedia Q&A *welcomes your questions and solutions. See page 12 for contact information.* ■

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TAP Designed for Microsoft Windows 95

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HERE'S HOW

REAL PROBLEM, REAL SOLUTION

How do you create a Web site that gets great results for your firm?—*John Van Sickle*

JOHN VAN SICKLE FOUND a Web site recipe for Sugar Spoon All Natural Cheesecakes.

A WEB SITE HAS BECOME about as de rigueur as a business card. But there are definite do's and don'ts when setting up a Web site to market your business. This month, John Van Sickle, who heads the international sales division for Sugar Spoon All Natural Cheesecakes in Lincoln, Nebraska (http://www.sugarspoon.com), tells how his company turned a bland Web site into a big hit. —*Editor*

THESE DAYS, EVERYONE has Web-footed dreams: "All I have to do is slap a picture of my Whizbang Widgets on a home page, the world will come running, and I'll retire by 50!" But as we found out, there's a lot more to making a Web site successful than just, well, having one.

Our 15-year old company—a subsidiary of Lincoln AG Product, Inc.—is in the cheesecake business. No, not centerfold photography: We bake creamy desserts and ship them all over the world. Besides ordering our cheesecakes through our 800 number, people can buy our cakes through flower services, door-to-door executive services, catalogs, and yes, the World Wide Web.

Like every other retail business, we do our share of direct mail, print, and radio advertising. Unfortunately, these media can be exorbitantly expensive: Our last direct mail campaign cost over $115,000 to produce and mail brochures to 100,000 people.

Back in August 1993, when Web-building software first hit the streets, we considered experimenting with this new medium for reaching customers. As it turned out, we were one of the first retail businesses to set up a Web site.

Since the University of Nebraska at Lincoln was one of the original Internet hub sites, we didn't have any trouble locating a variety of Internet service providers. The problem was finding the right one.

Too many of the ISPs we talked to were Al's Garage types—people at the beginning stages of their ISP business who had no clue how to make a Web site compelling or what we'd need to do. We finally hired a local firm, Global Internet Network Services, that had experts on staff with the perspective we wanted.

We began working with our ISP to create the site, using the Web's simple Hypertext Markup Language. The ISP also registered our domain and created a private directory for us.

PROBLEM: MAKING THE SITE EFFECTIVE

SETTING UP THE technical side was the easy part. Learning how to make the site effective was much harder.

Our first lesson was in graphics: We posted pictures of luscious chocolate and raspberry cheesecakes, but quickly found out our customers were growing old waiting for the pictures to download.

So we revised our site by including fewer graphics and more text, writing the most mouth-watering copy we could muster. Besides sales information, we offered information about the history of cheesecakes and of our company.

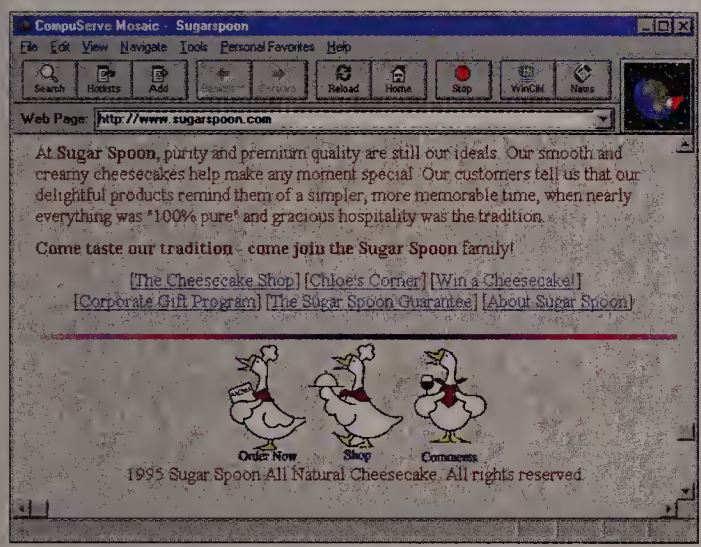
But people didn't seem to find that very appetizing. During our peak holiday season, the site scored only about 5000 hits. What's more, there was no way to get feedback from those customers.

We were learning that to make the site

PHOTOGRAPH: DAN WHITE

really work, it had to be fun, informative, and very interactive.

Our candor about Internet security taught us another, expensive lesson. We posted a notice on our site telling customers that if they used our online form to order a cheesecake by credit card, we could not absolutely guarantee that the transaction was secure—though our ISP provides excellent security. Orders dropped significantly.



SUGAR SPOON QUADRUPLED peak activity at its site by learning to work on the Web.

WEB-WISE SOLUTIONS

Here are five steps you can take to make sure that your Web site gets results:

- **Find a good Internet service provider.** Look for one that has good ideas and good service, but that also sets realistic expectations.
- **Get interactive.** Make your site fun, informative, and useful. Make it easy for customers to post requests or reach your staff directly by e-mail.
- **Don't overdo the graphics.** Dial-up modems don't have the patience for elaborate photos and video clips. Instead, try to avoid heavy graphics in favor of lively, well-written text.
- **Keep it simple.** People can get lost in a site that hawks too many wares or is overloaded with bells and whistles.
- **Make ordering easy.** For example, save your customers from having to do math by including the price of shipping and handling in the total cost.

SOLUTION: WORKING THE WEB THE WAY CUSTOMERS WANT

WE EASED OUR CUSTOMERS' security concerns by revising the order form, adding that they could give us their credit card information by fax or by calling our 800 number.

We worked with our ISP to put in an e-mail function so people could send us comments or ask questions. We made it possible for people to send messages to Chloe, our baker, and to get on our mailing list. We added a "Win a Cheesecake" contest, put up a Flavor of the Month, and even provided some recipes.

Most important, we added a form that people could fill in to tell us more about themselves and what kind of products they'd like. For example, we've found that many people would like us to produce sugar-free or lowfat cheesecakes.

At the same time, we concentrated on keeping the interface and features simple, so customers could find things quickly.

Our Web site now really works for us and for our customers. Our peak season traffic has climbed from 5000 to 20,000 hits a month. Though the site has produced only a modest 5 percent increase in overall revenues, our advertising costs have dropped dramatically. (We pay just $350 a month—and an occasional cheesecake—to our ISP for all services.) And we now have a worldwide presence for the price of a domestic one.

The Web site has also improved our internal processes. Because our customers input their own information, we have fewer typos and other data entry problems common to telephone sales.

Although our Web site still hasn't made us rich after three years online, learning to do it right is finally paying off.

Edited by Bronwyn Fryer

Bronwyn Fryer is a contributing editor for PC World. *If you use PCs to manage people and other resources in a business environment, we want to hear from you—we pay $300 for published columns. See page 12 for contact information.* ■

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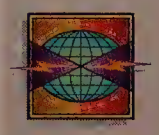

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Happy 2000—or 1900! ◆ Qwerty versus Dvorak ◆ Stop a hard disk from churning

DOOMSDAY 2000?

I'VE HEARD THAT at the turn of the century, computers all over the world are going to get confused about whether it's the year 2000 or 1900 and go haywire. How do I protect myself from chronological chaos?

Vincent Caintic, Williamson, West Virginia

THE PROBLEM IS REAL for many companies that rely on custom-written databases. Most software developers didn't figure on their (mostly mainframe- and minicomputer-based) programs being around at the turn of the century, so they created date fields and variables with only two digits. Any company that relies on such a program risks organizational disaster if it fails to correct the problem before the millennium.

Most of us can relax, however. If you use off-the-shelf software, including DOS and Windows, January 1, 2000 (a Saturday, thank goodness), will undoubtedly come and go just like any other day, as far as your PC is concerned.

If you don't believe me, leap forward into the aughts by entering the command **date 01-01-2000** at the DOS prompt. (Entering just the last two digits of the year generates an 'Invalid date' error, as does entering a four-digit year number in the pre-Reagan years.)

SHOULD YOU TRADE IN YOUR QWERTY KEYBOARD FOR A DVORAK?

I'VE HEARD THAT the Dvorak keyboard is more efficient and would like to try it out. Do I need to buy a new Dvorak-layout keyboard, or can I buy a keyboard that lets me switch between the Dvorak and standard Qwerty layouts? Or is there a software utility that will just remap the keys on my current keyboard?

Jon Rau, Vancouver, Washington

KEYS ON THE FIRST mass-produced typewriters, manufactured in the 1870s, were arranged in alphabetical order, and often jammed when early hunt-and-peckers struck adjacent letters sequentially. To reduce jamming, inventor Christopher Sholes came up with the "Qwerty" layout in which common letter pairs are spaced farther apart, but the new layout also made typing physically more difficult.

By the 1930s, typewriters had become less prone to jamming, so University of Washington professor August Dvorak developed a new keyboard design by placing the most commonly used letters on the home row (see **FIGURE 1**). But because of market factors any OS/2 user could explain, Sholes's inferior design has remained the standard.

Switching to the Dvorak keyboard layout could make you a faster, less frustrated typist, but consider these caveats: If, like me, you've spent years cranking up to a measly 35 words per minute as a touch typist, get ready to start all over again. You'll need a typing tutorial program that supports the Dvorak layout, such as Mindscape's wonderful Mavis Beacon Teaches Typing, and you'll need a few weeks when you can afford to be less productive at the keyboard.

And remember, it's still a Qwerty world out there. If you frequently work on other people's computers or typewriters as a temp or consultant, you'll have to remain nimble in Qwerty, so think twice about defecting to Dvorak.

Windows 3.1, 95, and NT let you change to the Dvorak layout in just a few clicks. In Windows 95 and NT 4.0, double-click the *Keyboard* icon in the Control Panel, select the *Language* tab, click the *Properties* button, choose *United States-Dvorak* from the 'Keyboard layout' drop-down list, then click *OK* twice. Windows will trouble you for its installation disk, but once you provide it, the new setting will take effect immediately without making you exit and restart Windows.

In Windows 3.1 and earlier versions of Windows NT, click the *International* icon in the Control Panel, and pick *US-Dvorak* from the Keyboard Layout drop-down list. If you're using a DOS version later than 5.0, download the MS-DOS Supplemental Disk (dos62sp.exe) from Microsoft's FTP site (ftp://ftp.microsoft.com/peropsys/msdos/public/supplmnt/) or from CompuServe (go msl). You can also get the disk for $10 by calling 800/426-9400. You'll find an OS/2 3.0 Dvorak keyboard conversion utility with instructions at IBM's FTP site (ftp://ftp.software.ibm.com/ps/ews/dvorkb/).

Once you've made the software switch, the computer's keys think they're on the Dvorak side of the looking glass, but the key-top labels are still arranged Qwerty-fashion. For about $40, you could buy a second keyboard, pop out the keys (use a dull pencil), then put them back in Dvorak order. You can also purchase key-top labels that display just the Dvorak layout, or both layouts, from Hooleon or Keytime.

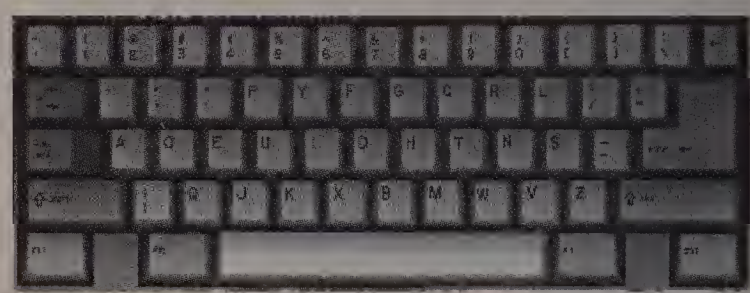

FIGURE 1: REMAP YOUR KEYBOARD, AND YOUR BRAIN, to Professor August Dvorak's more efficient design.

If you're rolling in dough, Northgate makes several more-expensive keyboards that switch between Qwerty and Dvorak modes. These keyboards relieve you of having to change the layout in software, as described above.

Since I have more than one computer, I decided to convert one to the Dvorak ▶

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layout and train as often as possible with Mavis Beacon. By the end of my first hour, I'd achieved a humbling 10 wpm on my home row keys.

• Mavis Beacon Teaches Typing $40; Mindscape; 415/897-9900

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• Dvorak conversion labels $21.95; Hooleon Corp.; 800/937-1337

READER SERVICE NO. 717

• Clear-sticker overlay $12.50; Keytime; 206/522-8973

READER SERVICE NO. 718

• OmniKey Ultra-T and OmniKey Ultra-F keyboards $129 each, OmniKey 101NI and OmniKey 102 keyboards $89 each; Northgate; 800/548-1993

READER SERVICE NO. 719

STOP WINDOWS 95'S HARD DISK AEROBICS

WINDOWS 95 SEEMS to be giving my hard disk a hard time. Even when I have no applications open, the drive often spontaneously starts grinding away for about 20 seconds for no apparent reason. I have 16MB of RAM and a large swap file, and I defragment the drive every few days. Since I have so much RAM installed, I tried fixing the problem by disabling the swap file, but I just get 'out of memory' messages when I try to run more than a couple of small applications. Is something wrong with my Windows configuration?

Rick Channing, New London, Connecticut

NO, BUT YOU'VE DISCOVERED that Windows 95's dynamic swap file is a restless beast. When there's no virtual memory swap file, Windows takes up as much as 12MB of RAM just for itself, which is why you run out of memory quickly when the swap file is disabled. Most of the grinding you're hearing is Windows reducing the size of the swap file during periods of low memory usage. With no applications running and 16MB of RAM, Windows waits for a moment of inactivity, then starts shrinking the swap file down to free disk space.

Unless disk space is tight, you can minimize this activity by increasing the minimum size of the swap file to about 20MB. To do so, double-click the *System* icon in the Control Panel, click the *Performance* tab in the System Properties dialog box, and click the *Virtual Memory* button. In the Virtual Memory dialog box, select *Let me specify my own virtual memory settings,* enter **20** in the Minimum field, then click *OK, Yes,* and *Close* (see **FIGURE 2**). When you restart Windows, your swap file will be much less agitated.

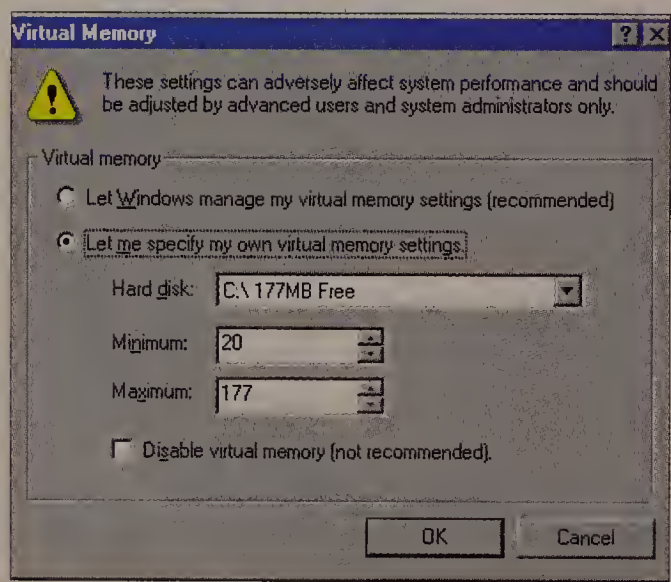
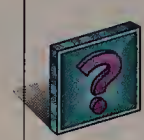


FIGURE 2: GIVE YOUR HARD DISK A REST by enlarging Windows 95's swap file.

WHERE DO BUG FIXES COME FROM?



THROUGH READING *PC World's Bug Watch* column [now called *Bugs and Fixes*], I've discovered that many of the programs I use have bugs and that there are "patches" I can download to fix those bugs. What are patches? How do I use one after I download it? And how do I avoid applying the patch incorrectly?

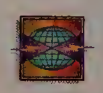
Mark Levin, Sapporo, Japan

NOT TO WORRY; if you've managed to successfully download the patch file, you've already cleared the biggest hurdle. Still, if you're a first-time bug fixer, let me give you a few pointers.

Patches come in two varieties. The first does its work as soon as you run it. BIOS upgrades typically fall into this category. Usually you can run this kind of patch from any directory on your hard disk, although in a very few cases you must copy the file to a floppy first. If so, you'll likely see instructions to that effect on the online service, BBS, or Web page from which you downloaded the patch.

The second type of patch comes as a collection of files compressed into one or more archive files to speed and simplify downloading. Since decompressing one of these tends to dump a bunch of cryptically named files into whatever directory the archive file (usually a .zip or self-extracting .exe file) is in, I recommend always creating a new directory and moving the archive file there first before extraction. That way, you can delete the extracted files easily after the patch process is complete. Check the decompressed files for a readme.txt, readme.1st, or read.me file, which usually explains the steps you need to follow.

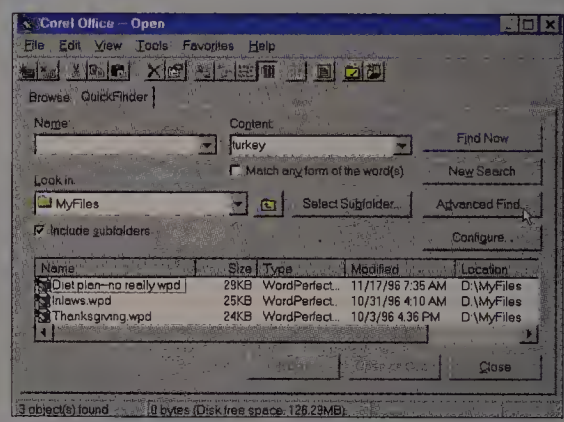
When you're finished, copy the original patch or archive file to a safe, easily accessible location, such as a well-labeled floppy disk, in case you have to reinstall the original application and need to reapply the patch.



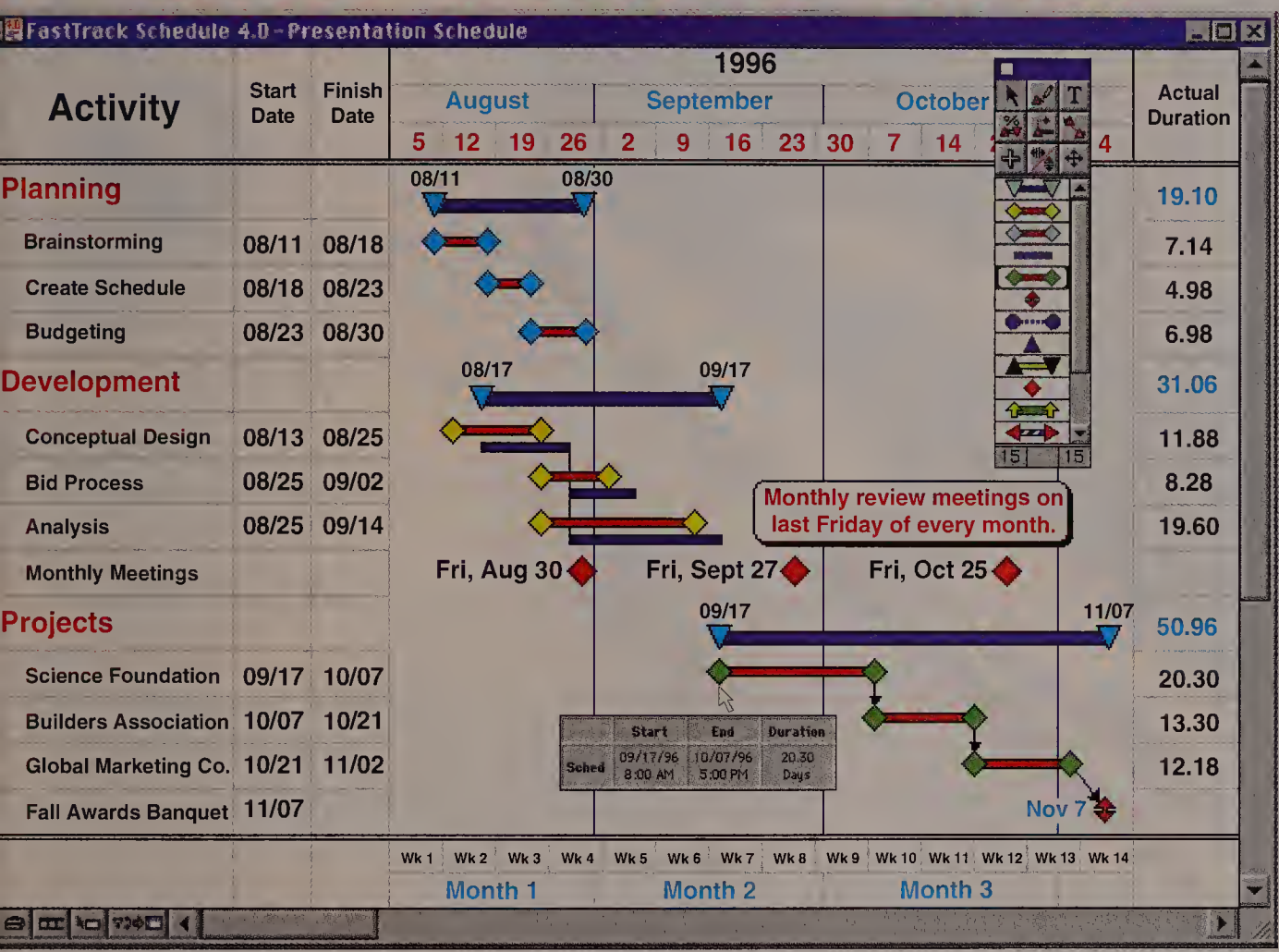
Find additional tips at http://www.pcworld.com/hereshow.html. Answer Line *welcomes your questions and tips and pays $50 for published items. Contributing Editor Scott Spanbauer is author of* The No B.S. Guide to Windows 95 *(No Starch Press, 1996, 800/420-7240).* *See page 12 for contact information.* ■

Find Every Last Document

IF COREL OFFICE PROFESSIONAL 7 FOR WINDOWS 95 can't find a file on your PC, it isn't there. Corel's QuickFinder supplements standard browse and preview capabilities with Boolean text searches and several other tools—including the ability to search on *synonyms.*



You can't stay on schedule if you don't have one.



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Minimize Open Windows With a Single Keystroke

WINDOWS 3.X AND 95

EVERY TOUCH TYPIST knows it slows you down to take your hands off the keyboard and reach for the mouse. That's why it's so much easier to minimize an open window (in any version of Windows) by pressing <Alt>-<Space> to display the control menu, followed by N (for *Minimize*). But this key combo can be a bit clumsy and doesn't work with all applications. Wouldn't it be better if you could dispatch a window with a single key?

To the rescue comes Windows Recorder, a macro utility that's free with Windows 3.*x* and that also works (for the most part) with Windows 95. If you upgraded to Windows 95 from Windows 3.*x* and don't see recorder.exe in your Windows folder, you can use the DOS expand utility to restore recorder.ex_ and recorder.hl_ from your original Windows 3.*x* disks. (If necessary, you can get expand.exe from those disks as well.) Just type **expand.exe** at the DOS prompt and follow the instructions from there.

To create your own window-minimizing macro, open a typical window in any application; you'll use it to record your macro. Make sure this is the only window open on the desktop, and size it to let you see minimized applications at the bottom of the screen (Windows 3.*x*) or on the Taskbar (Windows 95). Next, start Recorder. If you use Recorder regularly, open the file containing the macros you use every day to add this one.

Choose *Macro•Record*. In the dialog box, type a name for your macro. Under the *Shortcut Key* drop-down list, choose an easy-to-press key that you never use (such as <Scroll Lock>). Leave the Ctrl, Shift, and Alt boxes unchecked unless you have absolutely no choice. In the Playback section of the dialog box, select *Any Application* from the *To* drop-down list and *Fast* from the *Speed* list. Make sure *Continuous Loop* is unchecked and *Enable Shortcut Keys* is checked. Set the Record Mouse option to *Ignore Mouse*. Then click *Start* to minimize Recorder and start recording your macro.

If all your apps respond to the **<Alt>-<Space>-N** shortcut, press those keys now. If not, take advantage of Help, which is the last menu for almost all Windows applications. Press **<Alt>-H**, then **<Right>**, and finally **N** to minimize the window.

Next, click the *Recorder* icon (Windows 3.*x*) or button (Windows 95) just once. When prompted, make sure *Save Macro* is selected and click *OK*. Restore the Recorder window, and choose *File•Save* to store your macro in a file. Put this file in your StartUp group, with its properties set to Run Minimized, so your macro will be available every time you start Windows.

Now to minimize a window, just tap your shortcut key. If you have many Windows open, you'll love how easy it is to minimize one after another by pressing your shortcut key repeatedly. If you have one or two applications that don't use Help for their last menu (rendering the macro ineffective), just resort to the old **<Alt>-<Space>-N** shortcut.

Create Custom File Lists, Make Folders Fast

WINDOWS 95

WINDOWS 95 is supposed to be better than its predecessors, right? So how come I can't make Explorer or My Computer selectively display certain file types in a given folder. For example, I'd like a folder that shows only .doc files. This is one area where Windows 3.*x*'s File Manager retains an edge over Explorer.

But all is not lost. In Windows 95 you can create custom file lists that filter files by one or more extensions, by date, or even by content. And unlike File Manager, the custom list you build isn't limited to a single folder. Where has this feature been hiding? In the Find command.

Here's how to create a custom file list. Choose *Start•Find•Files or Folders* (in Explorer or My Computer, just press **<F3>**). Use wild cards (**?** for a single character, ***** for multiple characters) to type in the criteria for the files you want, as in **FIGURE 1**. Separate multiple file types with a comma, a space, or both—for example, **Oct*.xls, Nov*.doc, *.txt**. Underneath, type the path to search in—a single drive or folder. Be sure to uncheck *Include subfolders* if you don't want any folders within your target to be searched.

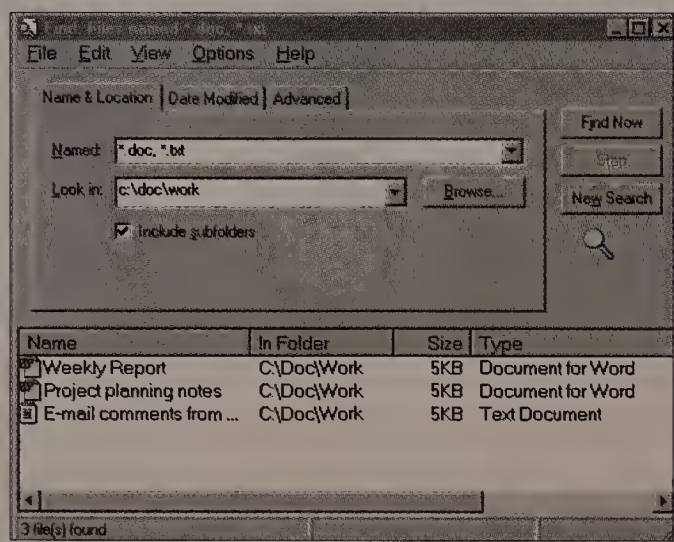
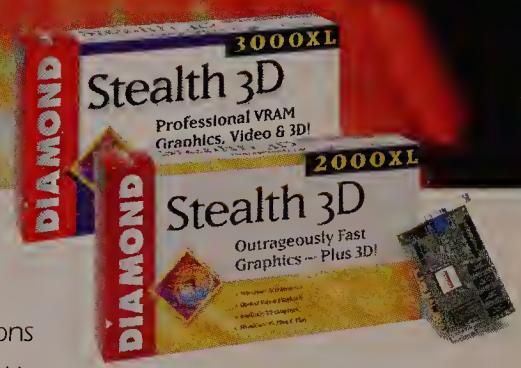


FIGURE 1: BUILD CUSTOM FILE LISTS by using the Find menu to display certain file types.

If you're searching for a particular file type that Windows understands, you don't have to worry about typing extensions in the Named box; just click the *Advanced* tab and choose a type from the *Of type* drop-down list. While you're there you can narrow your search by specifying ▶



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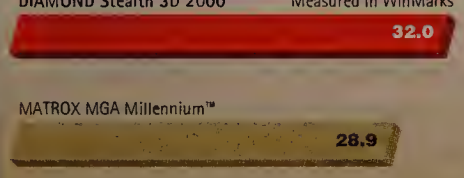

3D Hardware Features Comparison

	Stealth 3D Family	MATROX MGA Millennium
Gouraud Shading	◆	◆
Perspective Correction	◆	
Alpha Blending	◆	
Mip Mapping	◆	
Bilinear Filtering	◆	
Z-Buffering	◆	◆

Stealth 3D 2000/3000 Comparison

	Stealth 3D 2000XL	Stealth 3D 3000XL
Memory	Silicon Magic DRAM	VRAM
RAMDAC	135 MHz	220 MHz
Max Memory	4MB	8MB
Max Resolution	1280 x 1024	1600 x 1200
Bundled Software*	• Descent II • Compton's Interactive Encyclopedia 1996 • Destruction Derby	• Descent II • Compton's Interactive Encyclopedia 1996 • 3D F/X • Digital Video Producer • MS Internet Explorer

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files that contain a certain text string, or files that are a certain size. To narrow the search to the dates on which the files were last changed, click the *Date Modified* tab and specify the dates. When you're done, click *Find Now*.

To keep this list handy for future use, select *Options* from the menu, and make sure there's a check mark next to *Save Results*. Then choose *File•Save Search*. Find the resulting file on your Windows desktop, and store it in a convenient place—you can even drop it on the Start button if you want to open the list from your Start menu.

When the list is open, you can use the results window (see bottom of Figure 1) to do any file management you need. You might even want to organize work for certain projects this way. You can perform almost all the same functions as you would in Explorer, except that you can't drag files *into* this window—only *out*, for copying or moving to other folders within Explorer. And unlike in Explorer, the list will not be updated automatically; you'll have to do that task yourself by clicking *Find Now*.

NEW FOLDERS MADE SIMPLE

CONSIDERING HOW OFTEN some of us make new folders, it seems odd Microsoft hasn't made the chore simpler. First, you have to open the folder where the new folder will reside—you can't create one in Explorer's tree pane. Next, you wrangle with submenus: Either choose *File•New•Folder* or right-click in the file window and choose *New•Folder*.

Wouldn't it be easier if you could just right-click on a folder in the tree and choose New Folder from the menu? Fortunately, this is one feature that you can add yourself.

1. First, open Explorer to a folder where you normally store batch files. In this example, we'll use the Windows folder. Right-click in the file list and choose *New•Text Document*.

2. Double-click on the new document to open it in Notepad and create a batch file that contains these two lines:

@echo md %1\%%1 > c:\ windows\makdir.bat
start "c:\windows \makdir .pif"

This copies the DOS Make Directory (md) command and the currently selected directory (%1) plus a placeholder (%%1) into a new batch file (makdir.bat). Adjust the paths if you prefer to store your batch files in a folder other than Windows. Save the file with a name like **foldmakr.bat**.

3. In Explorer, right-click the batch file you just created and choose *Properties* (or select it and press **<Alt>-<Enter>**). Click the *Program* tab, and select *Minimized* under *Run*. Check *Close on Exit* and click *OK*.

4. In the same folder, look for a newly created file with the same name as your batch file but with the extension .pif (if your extensions are hidden, you'll recognize the file by its MS-DOS icon). Use the right mouse button to drag it to a blank area of the window, and choose *Copy Here*. Rename the copy **makdir.pif** (or **makdir** if extensions are hidden).

5. Right-click the copy and choose *Properties* (or select it and press **<Alt>-<Enter>**). Click the *Program* tab. In the box at the top, type a prompt such as **Type a name for your folder**. In the Cmd Line box, type **c:\windows\makdir.bat ?**. (Adjust the path and the file name to match the one you used earlier.) Leave the 'Run', 'Minimized', and 'Close on exit' options the way they are and click *OK*.

6. In Explorer, choose *View•Options* and click the *File Types* tab. For 'Registered file type', select *Folder* (not File Folder) and click *Edit*. Click *New*. For 'Action', type **New folder**, or any other words that you want to appear on your pop-up menu. For 'Application used to perform action,' type **c:\windows\foldmakr .bat**. Then click *OK* and close the remaining dialog boxes.

7. To use your new menu command, just select a folder in Explorer's directory tree, then right-click and choose *New folder* (or whatever you called your new command). Type a folder name when prompted, and remember to enclose it in quotation marks if the name includes any spaces or is longer than the old 8-plus-3, as in the example in **FIGURE 2**.

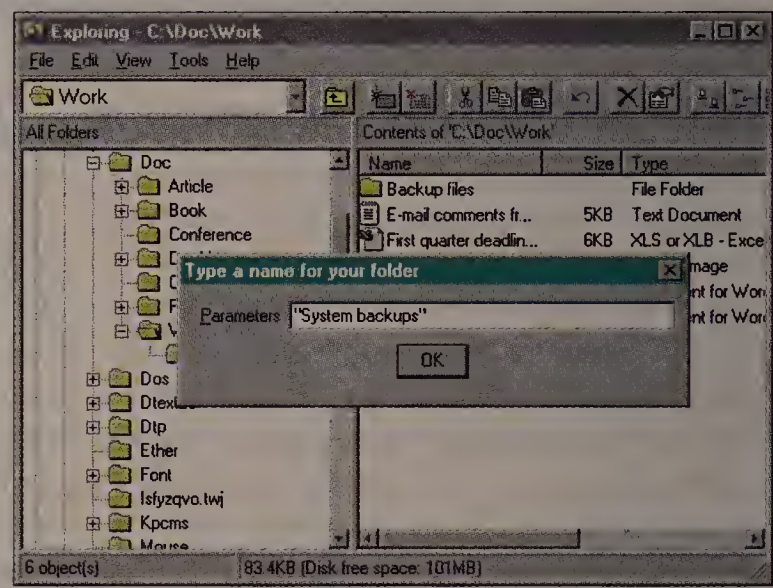

FIGURE 2: CREATE A COMMAND that lets you quickly make a new folder in Explorer's directory tree.

If you right-click a folder before selecting it, the command will still create a folder in that location—but you may have to refresh the directory tree (press **<F5>**) to see your new folder.

One other note: This command lets you make a new folder within an existing folder only. You can't use it to make a folder in the root of a drive. ▶

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Fake Long File Names, Find Extra Memory

WINDOWS 3.X

JEALOUS OF WINDOWS 95's long file names while you're stuck in Windows 3.x? Despair not: You can make Program Manager simulate long file names for frequently used documents.

Here's how: In Program Manager, create a group for your documents by choosing *File•New*, selecting *Program Group*, and clicking *OK*. Give the group a description and name and click *OK* again. Then, in File Manager, locate and select the files you work on most often.

Arrange File Manager and Program Manager so you can see both windows at once (double-click on the desktop to open the Task Manager and click *Tile*). Drag the selected files to your new group in Program Manager (the group window needn't be open—you can drop the files on its icon if you like). This drag-and-drop trick works only for files whose extensions are associated with an application.

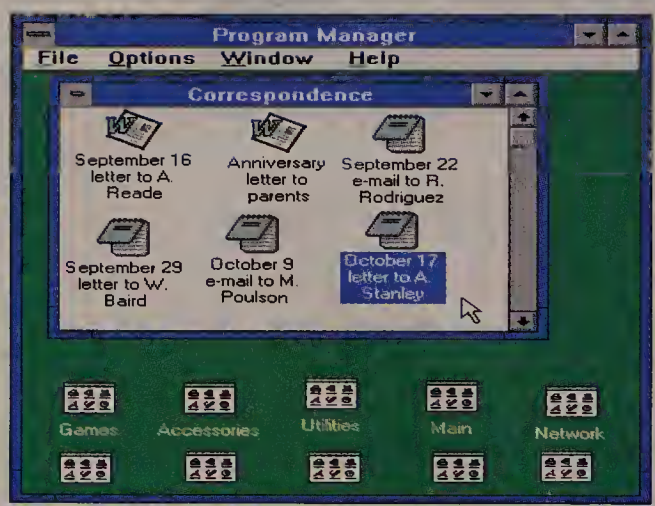


FIGURE 3: SIMULATE LONG FILE names in Windows 3.1 by dragging files to Program Manager.

To give a file a long "name," select its icon in Program Manager and press **<Alt>-<Enter>** to open the Program Item Properties dialog box. In the description box, type a name up to 40 characters long and click *OK*. Repeat for each icon. You can double-click the icon or its label to open and edit the file. (See **FIGURE 3**.)

When you no longer need a file, remember to delete both its Program Manager icon and the file itself—Windows won't do this housekeeping for you. You can make multiple groups to organize many files, up to a maximum of 40 groups with 50 icons in each group.

GETTING THE LAST BYTE

DOES YOUR WINDOWS 3.x system need every last byte of memory you can find? If you have VGA video but never need it in monochrome mode, you can free up a bit of memory by telling Windows to ignore the area of upper memory reserved for monochrome adapters—specifically address spaces B000h through B7FF.

First, make a backup of system.ini in the Windows directory in case of trouble. Then, in File Manager or Program Manager, choose *File•Run*, type **system.ini** and press **<Enter>** to open this configuration file in a text editor. Find the section under the [386Enh] heading, and look for a line that begins 'VGAMonoText='. Modify it to read **VGAMonoText=off** (or just add the line if it's not there). Then save the file and restart Windows. As long as no other hardware uses this memory space (you'll know if you receive an error message or your hardware doesn't work properly) and no applications need your VGA monochrome mode, the extra memory will be available to Windows.

Find additional tips at http://www.pcworld.com/hereshow.html. Windows welcomes your tips and questions and pays $50 for published items. Contributing Editor Scott Dunn is a principal author of The PC Bible, 2nd Edition *(Peachpit Press, 1995, 800/283-9444). See page 12 for contact information.* ■

Control Panel at Your Fingertips

Do you hate the slowdown of digging through menus and program windows just to tweak a single Control Panel item? Here are several ways to speed through Windows Control Panel at full throttle.

Quick access to favorites (Windows 3.x). You can save time by creating individual Control Panel icons in Program Manager.

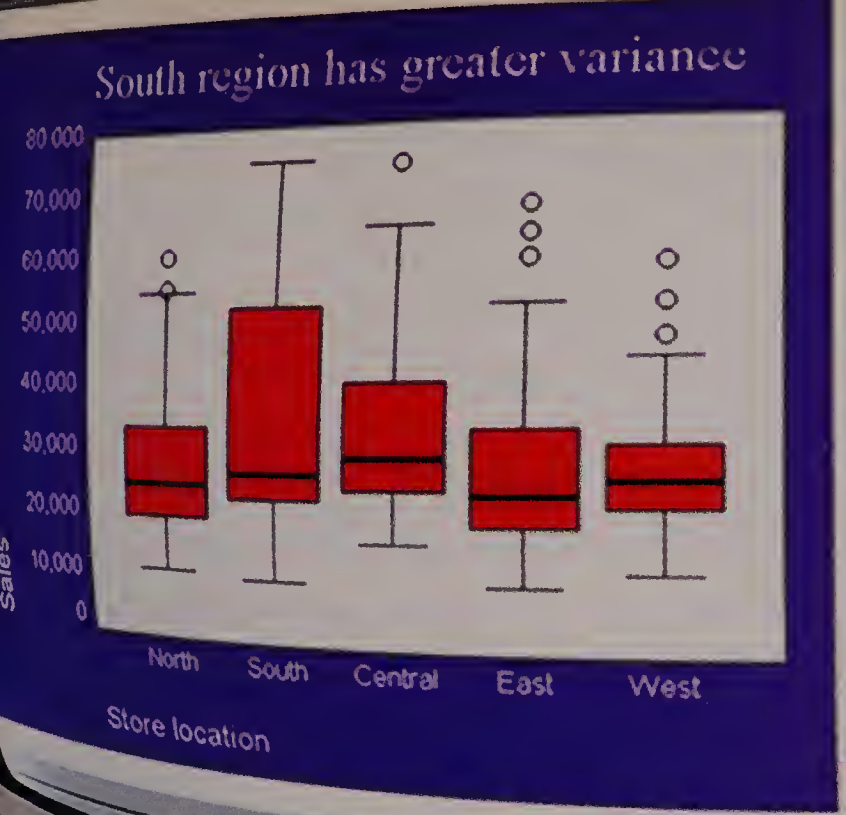
Choose *File•New*, click *Program Item*, and click *OK*. Type a name for your icon, such as **Desktop**, and for the Command Line text box type **c:\windows\control.exe main.cpl desktop** for the Control Panel Desktop icon (your path may differ). For other icons, replace *Desktop* with **Color, Date/Time, Fonts, International, Keyboard, Mouse, Network, Printers,** or **Ports.**

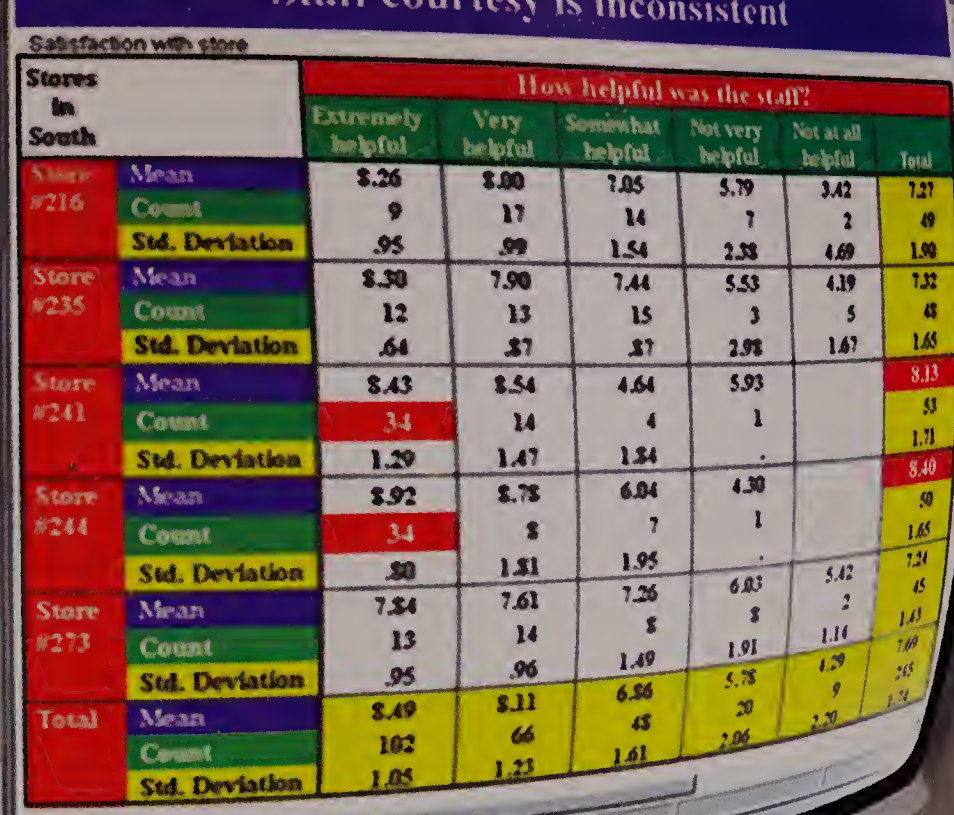
For still other control panel icons, skip this parameter and replace *main.cpl* with the appropriate .cpl file in your Windows\System directory (for example, **snd.cpl** for Sound). You can find custom icons in the windows\system\main.cpl file and other cpl files.

Quick access to favorites (Windows 95). To get your hands on your most frequently used control panel icons in Windows 95, create a menu: Right-click the *Start* button, choose *Explore*, and navigate to a good place for your Control Panel menu. Right-click in that folder, and choose *New•Folder*. Then choose *Start•Settings•Control Panel* and use the right mouse button to drag one or more icons to your new folder. When you release the mouse button, choose *Create Shortcut(s) Here*, and rename each Shortcut to suit your new menu.

Quick access to a Desktop tab (Windows 95). If you routinely change your computer's display properties (wallpaper or screen saver, for example), save time by creating a Shortcut to the Display Properties dialog box that automatically opens to the sheet of your choice.

Right-click on the Windows 95 desktop and choose *New•Shortcut*. For Command Line, type **c:\windows\control.exe desk.cpl, display, 2** (your path may differ). You can replace the tab number 2 (for the Appearance sheet) with 0 (Background), 1 (Screen Saver), or 3 (Settings). Click *Next* and type a name for your Shortcut. Then click *Finish*. To give this Shortcut an appropriate icon, right-click its current icon, select *Properties*, click the *Shortcut* tab, click *Change Icon*, type **c:\windows\system\desk.cpl** (your path may differ), and click *OK* twice.





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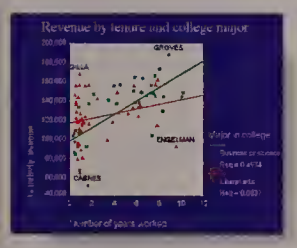

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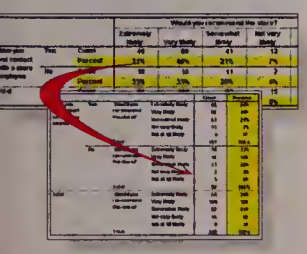

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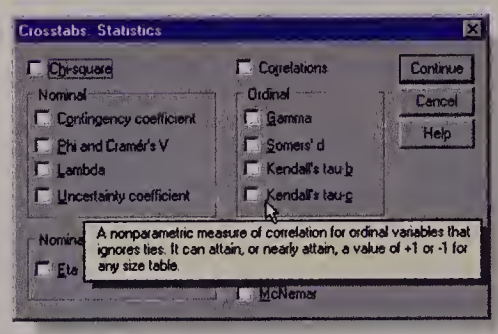

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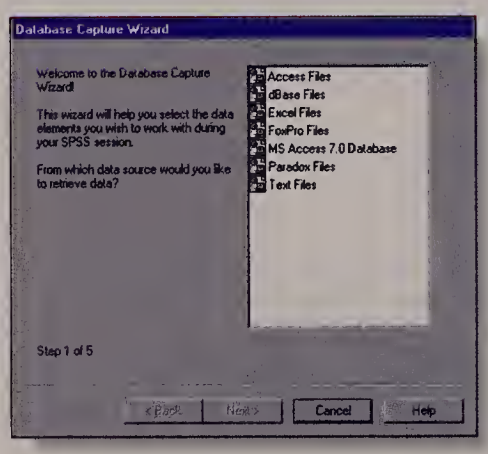

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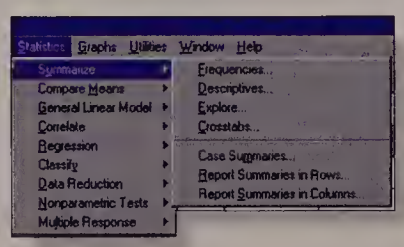

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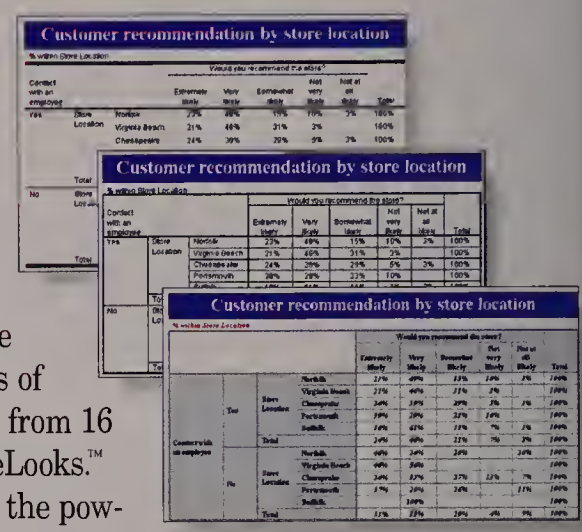

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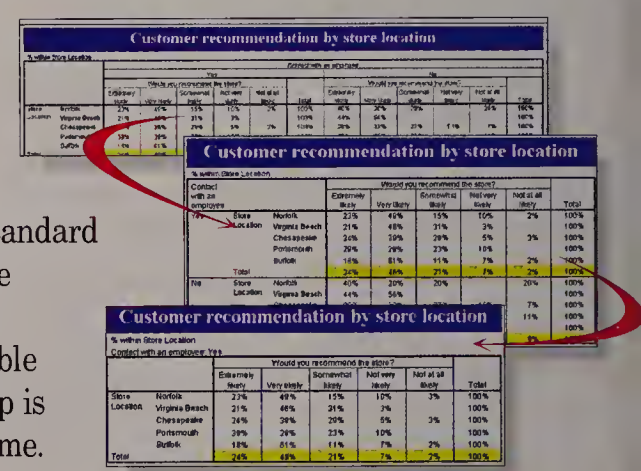

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Spruce Up Envelopes, Add Future Dates to Invoices

WORD PROCESSING

BY GEORGE CAMPBELL

HAVE YOU EVER wanted to add a graphic image or your company logo to the return address area of envelopes you create in Microsoft Word? AutoText—a little-known feature in versions 6 and 7—lets you do this quickly and easily. Just follow the steps detailed below and illustrated in **FIGURE 1.**

1. In a blank Word document, select *Insert•Picture*, locate and highlight the graphic file you want to add to your envelopes, and click *OK*.
2. Click on the graphic to select it, then change its size, if necessary, by dragging the sizing handles. You'll be inserting this on an envelope, so you don't want the image to be too large. To get an idea of the image size, select *View•Ruler* to display the ruler.
3. With the graphic still selected, choose *Edit•AutoText*. In the Name field of the AutoText dialog box, type **EnvelopeExtra1** (with the capitals), then click *Add*.
4. Select *Tools•Envelopes and Labels*. Click the *Envelopes* tab, if necessary, then click at the beginning of the first line of the return address and press **<Enter>** to add a blank line before the address. Click *Print*. If you're prompted to save your changes, answer *Yes*. Your logo will print above the return address on all envelopes, but it won't appear in the *Envelopes and Labels* dialog box.

If you want to change the graphic or resize it, select *Edit•AutoText*, choose *EnvelopeExtra1*, then click *Delete*. Repeat the steps above to make your changes.

INSERT A FUTURE DATE IN WORD

THERE ARE TIMES—for example, when you're creating an invoice—when it would be handy to insert a date that is a given number of days in the future. Word's Insert•Date and Time command is no help, since it inserts the current date. Here's a macro that asks you how many days in the future to set the date, then inserts that date at the cursor location. To create the macro, follow the steps below.

1. Select *Tools•Macro*, type **DatePlus** in the *Macro Name* field, and click *Create*. This calls up the macro editing screen.
2. Between the lines Sub MAIN and End Sub, type the following commands:

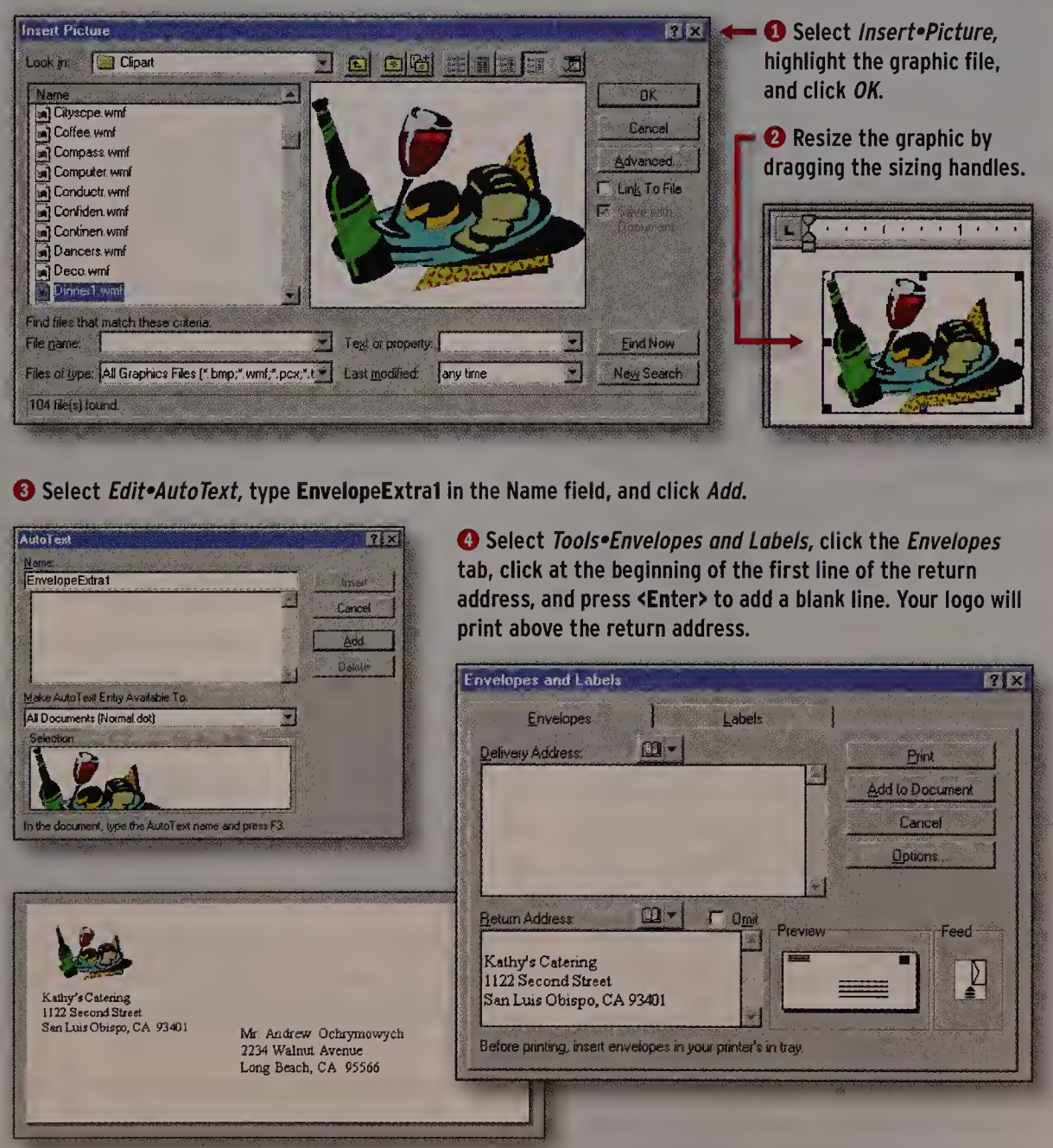
```
DaysToAdd$ = InputBox$("Add how
    many days?")
NumDays = Val(DaysToAdd$)
TargetDate = Now() + NumDays
a$ = Date$(TargetDate)
Insert a$
```

3. Select *File•Save All* and enter a name for the macro sheet. Answer *Yes* when prompted to save the changes.

When you need to insert a future date, move the cursor to the right location, ▶

STEP BY STEP

Add Graphical Logos to Your Envelopes in Word



❶ Select *Insert•Picture*, highlight the graphic file, and click *OK*.

❷ Resize the graphic by dragging the sizing handles.

❸ Select *Edit•AutoText*, type **EnvelopeExtra1** in the Name field, and click *Add*.

❹ Select *Tools•Envelopes and Labels*, click the *Envelopes* tab, click at the beginning of the first line of the return address, and press **<Enter>** to add a blank line. Your logo will print above the return address.

FIGURE 1: USE WORD'S AUTOTEXT FEATURE to add your logo above the return address.

Indenting Paragraphs in Word

I PREFER WordPerfect 6.1, but my office has standardized on Word 6.0. I miss WordPerfect's <F7> key, which indents an entire paragraph. Is there any equivalent keystroke in Word?

Michael Finley, Pinellas Park, Florida

IT'S JUST AS EASY TO indent a paragraph or a set of paragraphs in Word. With your cursor in the paragraph you want to indent, or with multiple paragraphs selected, press <Ctrl>-M to indent the paragraph to the next tab stop or <Ctrl>-<Shift>-M to move to the left one tab stop. To create or remove hanging indents, press <Ctrl>-T or <Ctrl>-<Shift>-T.

Editing Word's Dictionaries

I MADE SOME mistakes when adding words to my custom dictionary in Word 6.0. As a result, when I mistype these words, Word's spelling checker doesn't flag them as errors. How do I fix my dictionary?

Li Yu, People's Republic of China

WORD STORES its custom dictionary as an easy-to-edit ASCII file. Select *Tools•Options*, then click the *Spelling* tab in the Options dialog box. Choose the dictionary you want to edit from the Custom Dictionaries list and click *Edit*. Click *Yes* in the resulting dialog box, and click *OK* if asked to confirm the file format type. Click *OK* in the Options dialog box to close it, then make your changes in custom.dic. Select *File•Save*, then *File•Close*.

In Word 7, click the *Custom Dictionaries* button in the Options dialog box before choosing the dictionary you want to edit.

Lowering the Bar in WordPerfect

WHEN I CREATE envelopes in WordPerfect 6.1, the postal bar codes print above the address. My postmaster says that's fine, but I don't like the way it looks. How do I print the bar code below the address?

Erik Leach, Internet

SELECT *Format•Envelope*, then click *Options* in the dialog box. In the USPS Bar Code Options area in the next dialog box, select *Include and Position Below Address*, then click *OK*. Click *Close* in the Envelope dialog box to store your changes as the new default.

select *Tools•Macro*, choose *DatePlus* from the Macro Name list, and click *Run*. When prompted, type the number of days you want to add to today's date, and click *OK*.

If you plan to use this macro often, add it to a toolbar or assign it a shortcut key.

IMPROVING PERFORMANCE IN WORDPERFECT 7

COREL WORDPERFECT 7 offers some great new features, but some of these slow the application down, especially on PCs with only 8MB of memory. Here are a few ways you can eke out some extra performance from WordPerfect.

• Turn off WordPerfect's Spell-As-You-Go feature. Select *Tools•Spell-As-You-Go* to remove the check mark from the menu. When you want to use the spelling checker, just select this command again to turn the feature back on.

• WordPerfect's QuickSpots, which call up formatting commands, take a bite out of processor speed, since they appear each time you move the mouse over a new object. To turn these off, select *Edit•Preferences*, double-click the *Display* icon, deselect *QuickSpots*, then click *OK* and *Close*.

• You can turn off the display of WordPerfect's new guidelines for margins, columns, headers, footers, and tables. Select *View•Guidelines*, deselect the items you don't want to display, and click *OK*.

• WordPerfect 7 saves files in 6.1 format by default. To save files in the faster version 7 format, select *Edit•Preferences* and double-click the *Files* icon. In the Files Preferences dialog box, choose *WordPerfect 7* in the 'Default save file format' list, click *OK*, then click *Close*. One caution: WordPerfect 6.1 users won't be able to read files saved in this format.

Contributing Editor George Campbell is a contributor to The PC Bible *(Peachpit Press, 1995, 800/283-9444).*

Clock Time Intervals, Test Drive Excel Macros

SPREADSHEETS

BY RICHARD SCOVILLE

HOW DO YOU calculate the difference between two times—for example, when someone arrives and leaves work? Readers, as well as students in my training classes, ask me this question about once a week, so let's answer it again here.

Let's say Chris arrives at 10 p.m. and leaves at 6 a.m. the next morning. You enter the arrival time in cell A1, the departure time in cell B1, the formula =B1-A1 in cell C1, and then assign a numeric format that shows hours and minutes. If the duration is under 24 hours, 1-2-3 and Quattro Pro will display the proper answer, in this case 08:00. Excel, however, returns an error value.

In Excel, and in any case in which the interval is more than 24 hours, your formula must include not only the time value, but the date as well. The worksheet shown in **FIGURE 2** shows such a solution.

To create this worksheet in Excel, enter the data shown, including the formula in cell E3. Then format cell E3 to show cumulative time: Choose *Format•Cells*, click the *Number* tab, and select *Custom* in the Category list. Highlight *[h]:mm:ss* in the list of formats in the Type section, and remove the :ss from the end of the format in the 'Type' edit box. Click *OK* when you're finished. ▶

E3 =(C3+D3)-(A3+B3)

	A	B	C	D	E
1	Arrival		Departure		
2	Date	Time	Date	Time	Duration
3	10/15/96	10:00 PM	10/16/96	06:00 AM	8:00

FIGURE 2: CALCULATE THE DIFFERENCE between two times in Excel. The trick is in the numeric cell format.

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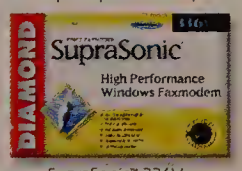

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In 1-2-3 and Quattro Pro, you must use a slightly longer formula to convert the time interval to a label that shows both the hours and minutes. Enter the following formula in cell E3:

```
@string(@round((((C3+D3)-(A3+B3))*24),0),0)&":"&@right("0"&@string((@mod(@round(((C3+D3)-(A3+B3))*24,12),1))*60,0),2)
```

USING EXCEL'S DEBUG WINDOW TO LEARN VBA

BEFUDDLED BY Excel's Visual Basic macro language, or tired of rewriting code when your macro crashes? This tip's for you! Excel's Debug window lets you experiment with VBA (Visual Basic for Applications) objects, their properties, and methods. When you're sure they'll work, you can use them in your own code.

To try it, launch Excel and open a new workbook. Enter data similar to that in **FIGURE 5**. Next, select *Insert•Macro•Module* to create a macro sheet. Select *View•Debug Window*, and make sure the *Immediate* tab is active. In the top pane of the Debug window, type your macro statements and press **<Enter>** to execute them.

Let's use the Debug window to select the first sheet in the current workbook. In the top pane, type **Sheets ("Sheet1").Activate** and press **<Enter>**. Excel activates Sheet1. To select a specific cell in the worksheet type **Range("B6").Select** and press **<Enter>**. The active cell moves to B6 (you may have to drag the Debug window out of the way to view the active worksheet). You can also use the Debug window to examine and change properties of worksheet objects. For example, to determine the numeric format of a range, type **?Range("B1:B10").NumberFormat** and press **<Enter>**. In this case, the macro returns the statement 'General', just below the statement you entered, to indicate that range B1:B10 is assigned the General format. To change the properties of an object—for instance, to change the background color of a range of cells—type **Range ("B1:B10").Interior .ColorIndex=6**, and press **<Enter>**. The background color of B1..B10 will be yellow.

If you're satisfied with the results of your macro, cut and paste it from the Debug window to the macro sheet in your workbook. If you're not satisfied, erase the statements or close the Debug window.

Contributing Editor Richard Scoville is a software training consultant based in Chapel Hill, North Carolina. ▶

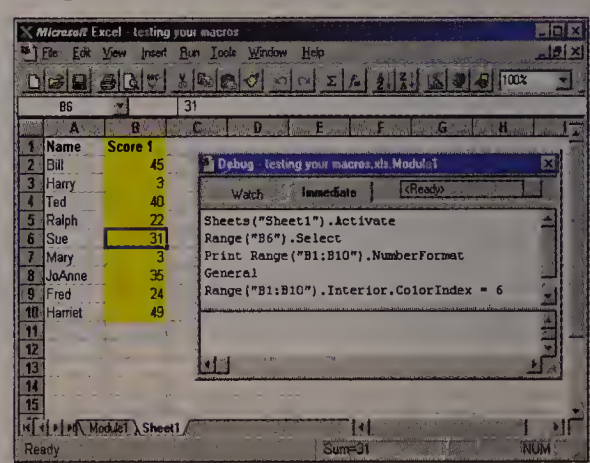

FIGURE 5: EXPERIMENT WITH EXCEL macro statements before adding them to your macros.

Timeline Charts in 1-2-3 and Excel

I'D LIKE TO SHOW the shift schedules of my staff in a timeline chart so that I can see at a glance how many people are available at any given time. How do I do this in 1-2-3?

Ashley Harvey, Palmdale, California

LIKE THIS: Create a horizontal bar chart, set the first data series to be the start time and the second to be the shift duration, then format the first series to be invisible. The end result is a chart like the one shown in **FIGURE 3**.

To build the model, create a new worksheet

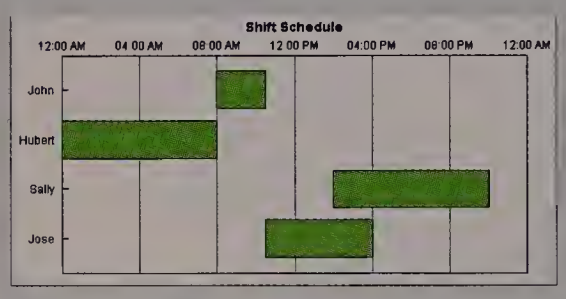

FIGURE 3: TRACK STAFF SCHEDULES in 1-2-3 and Excel in a standard chart. Here, we used a stacked bar chart and hid the first data series.

and enter the labels and time values shown in range A1..C5 of **FIGURE 4**. In 1-2-3, select range B2..C5, then select *Style•Number Format*. In the Number Format dialog box, select *Times* from the Format list and *11:59 AM* from the Times list. In Excel, select range B2:C5, select *Format•Cells*, click the *Number* tab if necessary, then choose *Time* from the Category list and *1:30 PM* from the Type list and click *OK*.

Next, enter the formula to calculate the duration. In 1-2-3, enter **+C2-B2** in cell D2 and copy it to range D3..D5. Then select range D2..D5, choose *Style•Number Format*, and in

	A	B	C	D
1	Name	Start	Stop	Duration
2	John	08:00 AM	10:30 AM	02:30
3	Hubert	12:00 AM	08:00 AM	08:00
4	Sally	02:00 PM	10:00 PM	08:00
5	Jose	10:30 AM	04:00 PM	05:30

FIGURE 4: ENTER THIS SAMPLE DATA to learn how to create a timeline schedule.

the resulting dialog box, select *Times* and *23:59*. In Excel, enter **=C2-B2** in cell D2 and copy it to range D3:D5. Next, select range D2:D5, select *Format•Cells*, click the *Number* tab, then choose *Time* from the Category list and *13:30* from the Type list and click *OK*.

Now construct the chart: In 1-2-3, select range A1..B5, then press and hold **<Ctrl>** while you select D1..D5. Choose *Tools•Chart*, and drag a box on the worksheet. Click the chart to select it and select *Chart•Type*, click *Horizontal* in the Orientation box, select the stacked bar chart type, and click *OK*.

Now, click the first data series (one of the red bars). Select *Style•Lines and Colors*. In the *Interior Pattern* drop-down list, select *T* (for transparent); under Edge Style, select *None;* and click *OK*. Select *Chart•Axis•Y Axis*. In the Axis Title box, enter **Shift Schedule**. Set the Upper Limit to **1** and the Lower Limit to **0**. In the Major Interval box, type **1/6** (to indicate one-sixth of a day, or 4 hours). Click *OK*. Now, click the Y axis. Select *Style•Number Format*, select *Times*, choose the format *23:59*, and then click *OK*. At this point, you have the basic timeline chart. Continue as you wish to remove or modify the legend, change the font sizes, and so forth.

To create a similar chart in Excel, select the ranges as described above, and click the Chart Wizard to create a horizontal bar chart. In Step 3 of the wizard, select option 3 for the stacked bar chart. In Step 4, under Data Series In, select *Columns;* enter 1 in both *Use First* boxes. In Step 5, select *No* for Legend, and enter appropriate titles. Click *Finish*. Double-click the chart to edit it, select the first data series, and select *Format•Selected Data Series*. Click *None* under Border and Area and click *OK*. Click the Y axis, select *Format•Selected Axis*, click the *Scale* tab, set the Minimum to **0**, the Maximum to **1**, and enter **0.166667** as the Major Unit. Click *OK*.

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Track Your Actions With Access Flag Fields

DATABASES

BY CELESTE ROBINSON

REMEMBERING what's happened in a database can be a challenge. Flag fields help you keep track of what you've done by leaving "footprints" that show, for example, whether an invoice has been printed. It takes some work to keep flag fields updated, but they make it easier to select records for viewing, printing, or reporting. A flag is often a one-character field that is marked with a "Y" or "N" (yes or no) or some other code. Sometimes a longer text or date field works better.

There are also different ways you can show a flag field on a form. Radio buttons or a pick list work well when you need to select from a group of more than two values. A check box is ideal for variables that have only two possible values. Here are a few examples of flag fields.

Radio buttons: To set these up, use the Option Group Wizard. You need to add the flag field to your database table first. Choose *Number* for the field type and *Long Integer* or *Integer* for the field size. (**FIGURE 6** shows a flag field called Status in a Customers table.) Once you've added the field to the table, open the form you want to add the flag field to and click *Control Wizards* in the Toolbox if it's not depressed.

To start the wizard, click the *Option Group* button in the Toolbox and drag an area on the form where you'd like the radio buttons. Follow the instructions to enter option labels (such as **Active**, **Inactive**, and **On hold**), and choose a default value. Access will assign the default value to the flag field in new records. In the step that lets you assign values to the label names, leave the default values of 1, 2, and so on, and click *Next*. In the step that asks 'What do you want to do with the value of a selected option?' click *Store the value in this field*, and select *Status* (or the name of the field you added) from the drop-down list. Click *Next* and change the style for the buttons, if you like. In the last step, enter a caption for the flag field and click *Finish*. The result will be similar to Figure 6.

To see the option buttons at work, update the status field in a few records. When you switch to a datasheet view of your table, you'll see the values (1, 2, or 3) of your selections.

FIGURE 6: RADIO BUTTONS (shown under the Status field on the right) work well when the flag field has more than two possible values.

Check boxes: To note a record's status when it can be in one of only two states (active or inactive, printed or not), use a Yes/No field. You can then click a check box on a form to toggle the field's value.

To place a check box on a form, first add a Yes/No field to the database table. Then open the form in design view, and follow the steps below (illustrated in **FIGURE 7**).

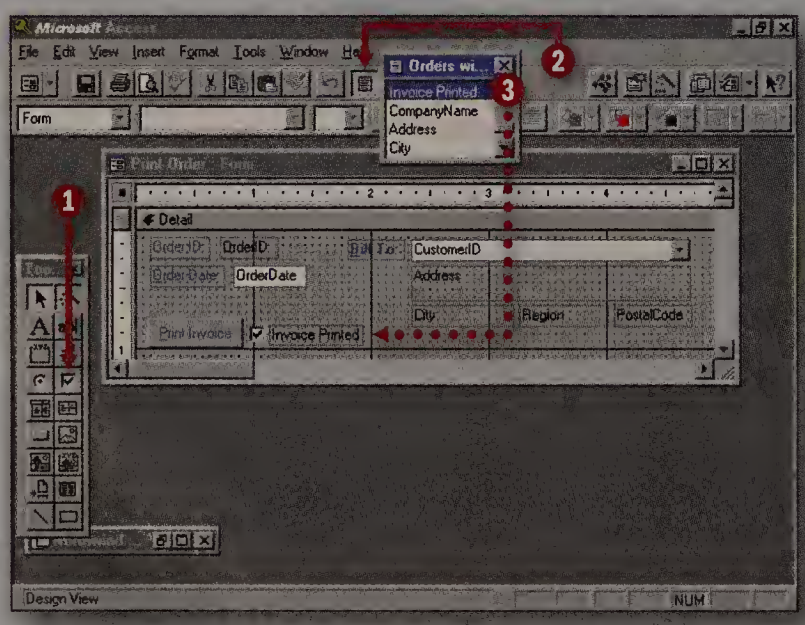
1. Click the *Check Box* icon in the Toolbox.
2. Click the *Field List* icon on the toolbar.
3. Drag—don't click!—your Yes/No field from the Field List to the form. When you release the mouse, a check box will be bound to your Yes/No field.

Marking time: Date fields also serve well as flag fields. Instead of marking a record with a "Y" to show it's been printed, mark it with the date the printing occurred.

Find files from this article and additional tips at http://www.pcworld.com/hereshow.html. Application Tips *welcomes your questions and tips and pays $50 for published items. See page 12 for contact information. Contributing Editor Celeste Robinson is coauthor of* Mastering Paradox 7 for Windows 95 *(Sybex, 1996, 800/227-2346).* ■

STEP BY STEP

Add a Check Box to an Access Form



1. Click the *Check Box* icon in the Toolbox.
2. Click the *Field List* icon in the toolbar.
3. Drag the Yes/No field, (called Invoice Printed in this example) from the Field List to the form.

FIGURE 7: A FLAG FIELD, such as the Invoice Printed check box on this form, helps you to keep track of what you've done to a record.

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To display PDF files with your Web browser, you need to download a copy of the free Acrobat reader, available at Adobe's Web site (http://www.adobe.com). Different flavors of the reader are available for Netscape Navigator and Microsoft's Internet Explorer. The newest version, Acrobat 3.0, works as a plug-in to your browser. You no longer need to set it up as a helper application. When you encounter a PDF file on the Web, Acrobat displays it automatically within the browser. It can even display HTML code and PDF files simultaneously.

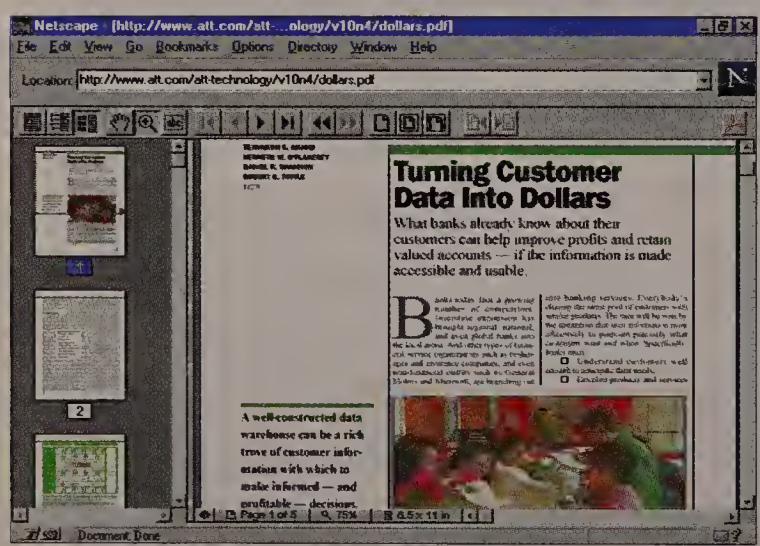

FIGURE 1: ACROBAT'S PORTABLE DOCUMENT FORMAT is still better than HTML for distributing highly formatted documents, like this one. Download the free Acrobat reader from Adobe's Web site. The newest version works as a browser plug-in.

BE KIND TO YOUR E-MAIL RECIPIENTS

EVERYONE HATES wading through a rehash of a previous message to get to the gist of the current communiqué. When replying to a message, quote only the line or two you're responding to rather than the entire message. This courtesy is especially important if you're a member of an Internet mailing list.

Your recipients will also appreciate more-descriptive subject lines, which make their mail easier to sort—and ensure that your messages aren't mistaken for cyberschlock and jettisoned before they're read.

DOES YOUR COMPANY NEED AN INTRANET?

LATELY I'VE BEEN seeing the word *intranet* a lot. What is it, a new kind of Internet?

Vincent Caintic, Williamson, West Virginia

THE NEWEST TECHNOLOGY buzzword has several meanings. According to some people, an intranet is merely Web server software that has been installed on a single PC in one department or another and is used to broadcast information to employees. But in its broader meaning, an intranet is an internal Internet, or any deployment of Internet protocols and software on an organization's private network. A connection to the Internet is not necessary.

Employees might use Netscape Navigator to access the company's server, where they could fill in customer order forms or read and edit spreadsheets and databases that were created with Java. Alternatively, they might use Qualcomm's Eudora e-mail program to exchange messages within the company.

The advantage of using Internet stuff on a private network is that it's easy to get up and running. You don't have to invest thousands of programming hours to create custom software applications. And you can script nifty user interfaces quickly and easily and add sound effects and animation to your applications.

SHARING NETSCAPE BOOKMARK LISTS

IS THERE ANY WAY I can easily copy my Netscape bookmark list and send it to my brother?

Dave Kutz, Boiling Springs, Pennsylvania

LOOK FOR a file named bookmark.htm in c:\program files\netscape\navigator. It contains the URLs for all your bookmarks. Since it's a text file, you can send it to your brother as an attachment to an e-mail message. Your brother can then save the attachment as a text file with an .htm extension, but tell him to name it something other than bookmark.htm so he doesn't overwrite his own bookmarks.

He can add your bookmark list to his own bookmark list by selecting *File•Open File* from the menu, and then selecting *Bookmarks•Add Bookmark.* ▶

Fit All Your Bookmarks in One Window

HERE'S HOW TO CREATE an easier-to-read bookmark directory for Netscape Navigator. In Navigator, select *File•Open File,* and look in the directory c:\program files\netscape\navigator for the file named bookmark.htm. Double-click the file name to open it, then from the menu select *Bookmarks•Add Bookmark.*

Now select *Bookmarks•Go to Bookmarks* and scroll to the bottom of the list, where you'll find a bookmark for your bookmark.htm file. Highlight it, and then drag and drop it at the top of the list. Close the Bookmarks window.

To see your new bookmark directory, select *Bookmarks* from the menu, and then select the first bookmark.

Adiel Yoaz, Internet

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Circle 212 on reader service card

ELECTION CENTRAL: THE BEST PARTIES ARE ONLINE

THE NIGHT OF THE LAST presidential election, I spent most of the time waiting to connect to Prodigy to learn the latest vote tallies. This year, all the major news networks and political magazines are on the Web. So are the candidates. Here are a few of the best spots to hang out on November 5. If you're looking for other sites with campaign news, go to the Vote Smart list (http://www.vote-smart.org/campaign_96/presidential).

George (http://www.georgemag.com/hfm/index.html): "Not just politics as usual." John F. Kennedy Jr. and his glam friends bring political discussion to nonpolitical readers. Find out what Madonna would do if she were in the White House.

CBS News Campaign '96 (http://www.cbsnews.com/campaign96/home/): Keep an eye on the election returns with the Tiffany network. Participate in online debates on hot topics like the tobacco industry and abortion rights.

MSNBC Decision '96 (http://www.msnbc.com/news/dec_front.asp): Join online chats with NBC news correspondents, Democratic and Republican leaders, and other politicos.

All Politics (http://allpolitics.com/): Cast your vote for or against progressive family values, school choice, and the minimum wage hike.

Republican Main Street (http://www.rnc.org/).

The Democratic Party Online (http://www.democrats.org/).

PoliticsNow Campaign '96 (http://www.politicsnow.com/campaign/).

National Public Radio (http://www.npr.org/hotnews/election96.html).

The Atlantic Monthly Election Connection '96 (http://www.theatlantic.com/atlantic/election/connection/).

U.S. News/Election '96 (http://www.usnews.com/usnews/wash/election.htm).

USA Today Election '96 (http://www.usatoday.com/elect/elect96.htm).

Ladies Home Journal/League of Women Voters Power the Vote (http://www.lhj-lwv.com/).

GETTING TRUMPET WINSOCK OFF THE PHONE

I USE TRUMPET 2.0 to access my Internet PPP account. Every time I select Dialer/Bye to disconnect from the Internet, my modem stays initialized. Then, when someone calls me, my modem screeches in the person's ear. How do I get that Bye command to shut down my modem fully so that I don't have to keep turning off my PC?

Alan Schneider, Colorado Springs

TRUMPET WINSOCK (or any communications program) tells the modem to do something, like dial or hang up, by issuing an AT command (a command that begins with the letters *AT*).

To cure Winsock of its rude phone behavior, select *Dialer•Edit Scripts*, and select the *bye.cmd* script. Find the line that reads 'Output ATH0/n' and change it to read **Output ATH0&D2S0=0**. Then enter the command **set DTR off**. Select *File•Save*, and exit back to Trumpet.

When you tell the modem to hang up, its DTR signal will drop, disconnecting the modem. In the modem's memory, its S register 0 is set with a decimal value indicating the number of rings the modem will wait before answering a call. Setting this register to 0 disables the modem's auto-answer feature.

Internet Tips welcomes your questions and tips and pays $50 for published items. Contributing Editor Judy Heim is author of Internet for Cats *and* I Lost My Baby, My Pickup and My Guitar on the Information Highway *(No Starch Press, 1995, 800/420-7240). See page 12 for contact information.* ■

Don't Trust Navigator With Your Cache

IN FOLLOWING your tips on managing a Web browser's disk cache (*Online*, June), I discovered an interesting phenomenon. Even though my browser's disk cache was set to the recommended 5MB, when I selected Options•Network Preferences and clicked the Clear Disk Cache Now button, I got back a whopping 23MB of disk space back! Most of those 23MB were file allocation units for the cache.

The lesson: No matter what your cache size is set to, you should delete the contents of your browser's cache directory at least once a month.

A. L. O'Hearn, Johnson City, Tennessee

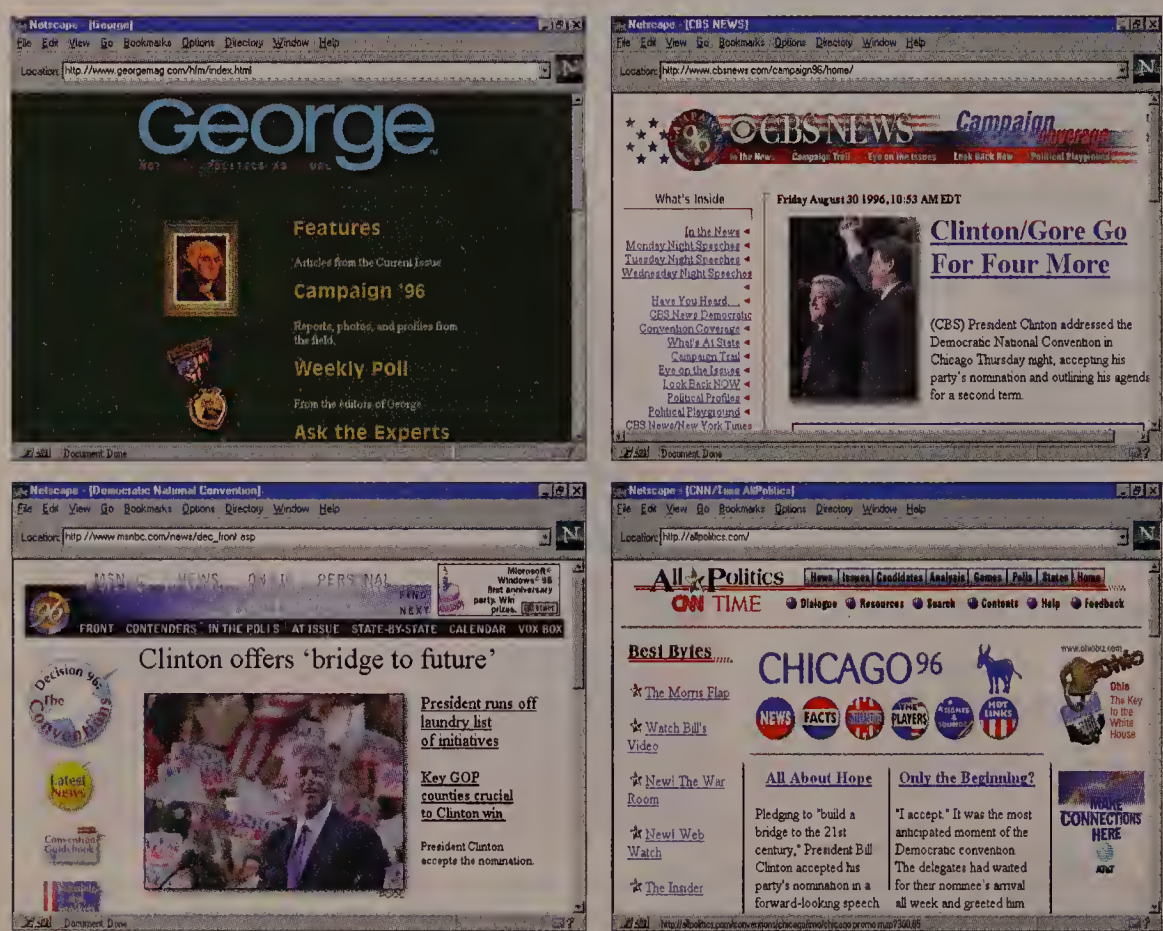

FIGURE 2: SPEND A FESTIVE PRESIDENTIAL ELECTION EVE 1996 online with John F. Kennedy Jr. and friends, and correspondents from CBS, MSNBC, and CNN.

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Take Practical Steps Toward Tomorrow's PC Standards

TO PARAPHRASE AN old homily, God must love standards—why else would there be so many of them? This year we've got new standards for disks, buses, and confusion. Let's take a look at what's coming—and at practical short-term solutions to the problems these standards address.

ULTRASCSI IS ULTRASENSIBLE

TALK TO DISK DRIVE makers, and you'll think the solution to all our problems is a new standard called Fibre Channel. But it's probably not a solution for you—yet.

Despite its name, Fibre Channel uses ordinary copper connections to transfer data at 100 megabits per second and faster. It's one of four connection schemes allowed under the SCSI-3 standard, another being the SCSI Parallel Interface—the SCSI we know today. **FIGURE 1** shows where Fibre Channel fits among disk interfaces.

You can buy Fibre Channel drives today. Don't. You'll need a new drive plus a new host adapter—and probably a new credit card—to take advantage of its virtues.

Fortunately, there's a good interim alternative: UltraSCSI. UltraSCSI is familiar Fast SCSI-2 taken one step further. Where Fast SCSI-2 doubles the original SCSI-1 data rate, pushing the bus speed from 5 to 10 MHz, UltraSCSI doubles it once again, to 20 MHz.

UltraSCSI speed is independent of bus width, so it delivers three performance levels. With 8-bit connections, it delivers a peak transfer rate of 20MB per second. With 16-bit Wide UltraSCSI (probably the most common form), you get 40MB/sec. And with a 32-bit Wide connection, you can expect 80MB/sec—a rate that will give PCI adapters a run for their money.

UltraSCSI is backward compatible with Fast SCSI-2 and costs drive makers little more to make. And the bus clock of UltraSCSI is independent of file structures, partitioning, and even low-level disk format. You can plug an UltraSCSI drive into your current SCSI host adapter (with the right cable) and get all the speed your host adapter can deliver. If you later buy an UltraSCSI host adapter or move your hard disk to another PC, you gain more speed without monkeying with software, files, or other such nonsense. Put UltraSCSI on your shopping list for your next hard disk.

Data Transfer Rates of Various Disk Interfaces

Interface	Peak transfer rate (MB per second)	Maximum number of devices
Floppy disk	0.125	2
IDE	4	2
SCSI	5	7
Fast SCSI-2	10	7
EIDE	16	4
16-bit UltraSCSI	40	15
32-bit UltraSCSI	80	15
Fibre Channel	100	126

FIGURE 1: ULTRASCSI DRIVES and adapters offer greater performance than existing SCSI and EIDE, at affordable prices.

OPEN YOUR SERIAL BOX

THE UNIVERSAL SERIAL BUS is not Kellogg's idea of public transportation. It's a radical rethink of peripherals connections that will replace serial and parallel ports. One USB port can link your PC to 127 devices at up to 12 megabits per second.

USB will connect just about every kind of peripheral except those demanding very high speed connections, such as hard drives. It gives every connector its own jack and links all devices with one type of cable, without the usual hardware hassles. You knot together as many USB devices as your PC can handle by connecting them to hubs—peripherals with extra USB jacks. USB also offers Plug and Play for peripherals, can distribute power to low-power devices, and accommodates smaller PCs (especially notebooks).

This is a grand idea and the future of most external computer peripherals.

But keep in mind that these peripherals have not yet arrived. And when they do appear in force, you can add a USB expansion board to your existing PC.

In the meantime, if you already have a PC and serial devices and too few ports to link them, use the following tried-and-true serial expansion options:

◆ **A port adapter expansion board** can add two or more serial ports if your system can handle them. Check your available resources with Microsoft Diagnostics (the msd.exe program that accompanies DOS) or Windows 95's Device Manager. Windows 95 can handle eight serial ports, but you'll probably want to stick with four. If you want to connect a modem, be sure you get a 16550A or later UART chip on the board or, better still, a high-speed enhanced serial port.

◆ **A switch box** lets you divide up the ports you have if you cannot add more. Although inconvenient—you must physically move the switch to choose between devices, and you've still got the hassle of changing driver software—a switch box eliminates the nuisance of plugging and unplugging cables. Avoid expensive adapters, and match the connectors on the switch box to your peripherals. A 9-wire switch works in most situations.

◆ **Intelligent Y connectors** make the switching automatic. PI Corporation offers a $49.95 WhyMouse that lets you connect two mice to a single port and use either indiscriminately. The company's $49.95 DigiDapter connects a mouse and digitizing tablet to a single port.

• PI Corp., 800/628-3185

READER SERVICE NO. 672

Find additional tips at http://www.pcworld.com/hereshow.html. Hardware *welcomes your questions and tips and pays $50 for published items. Winn L. Rosch is author of the* Winn L. Rosch Hardware Bible *(Sams Publishing, 1994, 800/545-5914). See page 12 for contact information.* ■

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Play MPEG Video Files, Create ActiveMovie Clips

HAVE YOU EVER DOUBLE-CLICKED an MPEG video file in Windows 95's Explorer, only to receive an error message from Media Player or have Explorer's Open With dialog box ask you to pick an application for playing the clip? Maybe you've never had an MPEG player, or you had one and uninstalled it, or you installed another tool (such as QuickTime for Windows) that wrecked your .mpg file association.

In any case, there's a quick fix. Although Media Player can't play MPEGs by itself, it can with Microsoft's ActiveMovie Media Player for Windows 95 (see **FIGURE 1**). You can retrieve a beta version of the 1MB installation file from the company's ActiveMovie download Web page (http://www.microsoft.com/advtech/ActiveMovie/ download.htm).

In addition to playing MPEG flicks, ActiveMovie supports QuickTime (.mov or .qt) and Video for Windows (.avi) clips, along with a variety of sound file types. And there's an important benefit on the side: ActiveMovie is a *streaming player,* which means that you can see and hear a file retrieved from a Web page while the file is still downloading. If you want to take a look at how this works, install ActiveMovie, then check out the ActiveMovie Streaming Format samples page (http://www.microsoft.com/advtech/activemovie/samples/samples.htm).

FIGURE 1: PLAY MPEG VIDEO UNDER WINDOWS 95 with Microsoft's free ActiveMovie Media Player add-on.

MAKE YOUR OWN ACTIVEMOVIES

IF YOU'RE INTERESTED in creating ActiveMovie Streaming Format movies with your own audio and bitmapped image files, check out the ActiveMovie Stream Editor (see **FIGURE 2**), available from the same Web site as the ActiveMovie player.

Microsoft undoubtedly will make ActiveMovie part of Windows 95 in an upcoming Service Pack. As ActiveMovie becomes more popular, visitors to your .asf-laced Web pages will get an audiovisual treat. The program lets you use .wav audio files and .bmp, .gif, and .jpg images, and also converts PowerPoint presentations using that program's Internet Assistant add-on. When you're satisfied with your combination of sound track and still images, the utility combines them into an audiovisual clip compressed and streamlined for modem transmission.

OPEN NOTEBOOK, AND FIRE WHEN READY

WITH THEIR high-resolution screens, built-in CD-ROM drives and audio, and fast processors, today's best-selling portable computers can do just about anything your desktop multimedia system can—except support a joystick for hardcore gamers.

Often an optional desktop docking unit or port replicator holds a game port. But docking units cost $300 and up, and they don't let you blast robot spaceships when you're cruising with your laptop over Des Moines.

If you don't need all the conveniences (and high cost) of a docking station, consider a PC Card game port like New Media's Gamejammer (list price $249) or U.K. manufacturer JC Designs' bargain GameCard II (about $80 direct). Both are Plug and Play Type II cards that come with drivers for DOS, Windows 3.1, and Windows 95, and should work with any joystick. Gamejammer also incorporates an 8-bit mono sound card with an integrated speaker.

If you're interested in upgrading your laptop's sound capabilities along with adding a joystick port, consider IBM's $105 PCMCIA 3D Sound Card, which offers more realistic wavetable synthesis and 3-D audio. Unfortunately, an optional dual port joystick cable costs an additional $95.

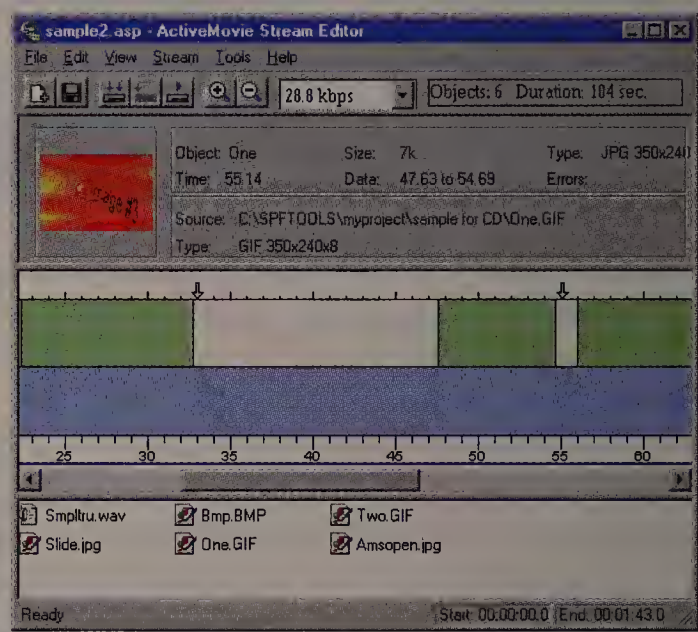

FIGURE 2: CREATE WEB-FRIENDLY MULTIMEDIA SLIDE SHOWS with the free ActiveMovie Stream Editor.

- GameCard II about $80; JC Designs; 44/1371-874478; 44/1371-874300 fax

READER SERVICE NO. 673

- Gamejammer $249; New Media Corp.; 800/453-0550

READER SERVICE NO. 674

- IBM PCMCIA 3D Sound Card $105, optional joystick cable $95; IBM Corp.; 800/426-2968

Multimedia Tips *welcomes your questions and tips and pays $50 for published items. Scott Spanbauer is a contributing editor for* PC World. *See page 12 for contact information.* ■

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Setting Up Your New PC

THERE YOU STAND, SURROUNDED by large boxes. Your brand-new PC has arrived! Whether it's for your home or office, a gift for your children, or the latest addition to your computer lab, unpack it and set it up as quickly as possible to make sure you've received exactly what you ordered and that everything works.

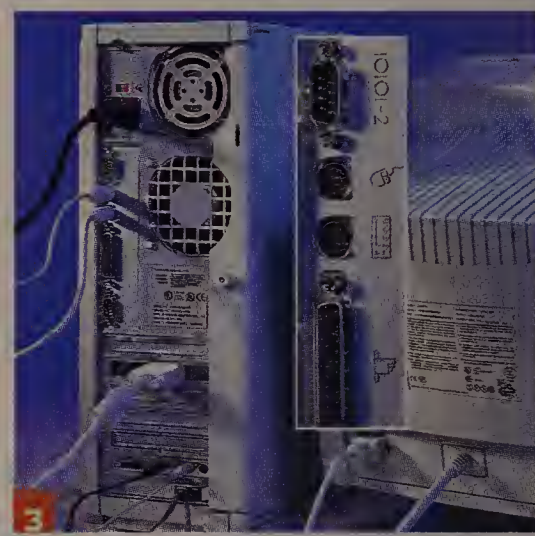
That's especially important if it's a holiday gift, since 2 a.m. on Christmas morning is not the time to find that your gift won't run. Once you know it's working, repack it and enjoy the holiday instead of waiting on the telephone for technical support.

No matter how experienced you are, stick to the essentials—and *read the manual!* See PC World Online (http://www.pcworld.com/hereshow/) for additional tips and hints.

Stan Miastkowski is a PC World *contributing editor.*

Open all the boxes. Give yourself plenty of space to work in and plenty of time. Remove everything in every box, and make sure you received exactly what you ordered. If the vendor included a packing list, check each item off as you unpack it. Save everything—even the plastic bags. Don't fill out the warranty cards yet.

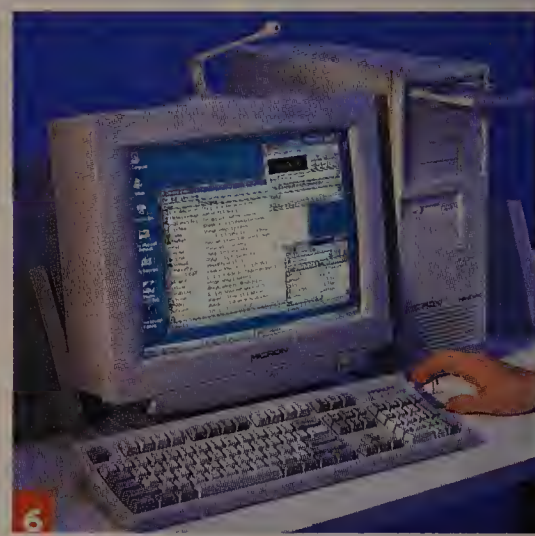
Set it up. Place the main system unit, monitor, keyboard, mouse, speakers, and whatever else you purchased, on a table; lay them out in approximately the way you'll use them. Make sure you can get behind the hardware so you can easily hook up all the cables. Look for a Getting Started manual. Then read it.



Get connected. First plug in all the cables and then the AC power connections. This can get confusing, since some manufacturers place incomprehensible icons on various ports, so read the manual if necessary. Don't force any connections. If your PC has an internal modem, remember to connect the telephone line.

Power up. Turn on the monitor, the speakers, and the system unit. If Windows 95 launches without any trouble, follow the on-screen directions and then skip to step 6. If nothing happens when you turn everything on, check your AC power connections. If you see odd error messages or have other problems, see step 5.

Problems? First check that the monitor cable is attached securely to its port. Then remove the main system unit's cover. Make sure all internal cables are attached correctly and that all plug-in cards are seated securely in their slots. Power up the system again. If it still doesn't work, call your dealer or vendor's technical support line.



Try it out. Run a few applications, including one on CD-ROM. Play a music CD, record someone singing, dial out through the modem, and print a few documents. If everything seems to be working correctly, store all the boxes and packing materials in the attic, and fill out and mail all the warranty cards. ■

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110CT	Pentium 100	11.3" Active	8/772MB	2499

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Tecra 720

- Pentium 133MHz processor
- Built-in 28.8 fax/modem
- Built-in 6X CD-ROM drive
- Optional DeskStation capabilities

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720	Pentium 133	12.1" Active	16MB/1.1GB	$5399

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Tecra 730

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Satellite Pro 420

Satellite Pro 420

- Pentium 100MHz processor
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- 11.3" Dual Scan & Active Matrix displays
- Built-in SoundBlaster Pro compatible audio

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420CDS	Pentium 100	11.3" Dual Scan	8/772MB	$2499
420CDT	Pentium 100	11.3" Active	8MB/1.2GB	3299

Portégé 650

- 133MHz processor
- Built-in 28.8 fax/modem
- Built-in SoundBlaster compatible audio
- Up to 11.3" Active Matrix display

Portégé 650

Model	Processor	Screen	RAM/HD	Price
650CT	Pentium 133	11.3" Active	16MB/1.2GB	$4499

Tecra 500

- Pentium 120MHz processor
- Built-in 6X CD-ROM drive on 500CDT, optional accessory on Tecra 500CS
- 16MB EDO RAM memory
- 12.1" Super VGA displays

Tecra 500

Model	Processor	Screen	RAM/HD	Price
500CS	Pentium 120	12.1" Dual Scan	16MB/1.3GB	$3699
500CDT	Pentium 120	12.1" Active	16MB/1.3GB	4699

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365XD	Pentium 100	11.3" Dual Scan	8/810MB	2299
365X	Pentium 100	11.3" Active	8/810MB	2399
365XD	Pentium 120	11.3" Dual Scan	BMB/1.1GB	2549
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560	Pentium 120	12.1" Active	8/810MB	3749
560	Pentium 133	12.1" Active	8MB/1.1GB	4199

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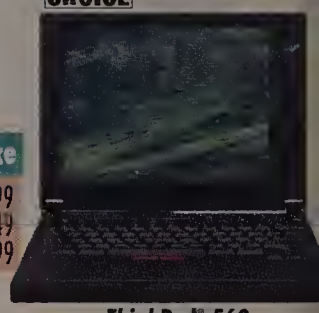

ThinkPad® 560

COMPAQ

Armada

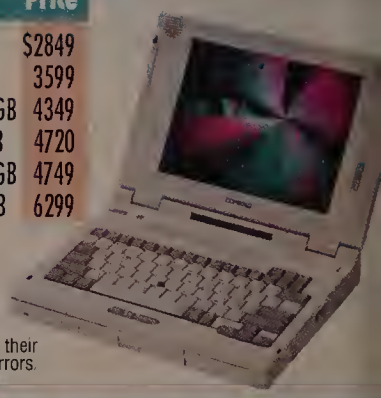
Compaq Armada

Model	Processor	Screen	RAM/HD	Price
1120	Pentium 100	10.4" Dual Scan	8/810MB	$1879
1120T	Pentium 100	10.4" Active	8/810MB	2199
4110	Pentium 100	11.3" Dual Scan	8/810MB	2479 *
4110D	Pentium 100	11.3" Dual Scan	8/810MB	2899 *†
4120	Pentium 120	11.3" Dual Scan	16MB/1.1GB	2999 *
4120T	Pentium 120	11.8" Active	16/810MB	3699 *
4130T	Pentium 133	11.8" Active	16MB/1.1GB	4399 *

* Features built-in audio
† Includes 4X CD-ROM drive

LTE 5000 Series

Model	Processor	Screen	RAM/HD	Price
5150	Pentium 100	11.3" Dual Scan	B/810MB	$2849
5250	Pentium 120	10.4" Active	16/B10MB	3599
5280	Pentium 120	11.3" Active	16MB/1.35GB	4349
5200	Pentium 120	10.4" Active	8MB/1.35GB	4720
5300	Pentium 133	12.1" Active	16MB/1.35GB	4749
53B0	Pentium 133	12.1" Active	16MB/2.2GB	6299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Monte Carlo Notebook

Model	Processor	Screen	RAM/HD	Price
MCARLO	Pentium 100	11.3" Active	8/810MB	$2999
MCARLO	Pentium 100	11.3" Active	8/810MB	3149 *
MCARLO	Pentium 120	11.3" Active	16MB/1GB	3699
MCARLO	Pentium 120	11.3" Active	16MB/1GB	3849 *
MCARLO	Pentium 133	12.1" Active	16MB/1GB	4499
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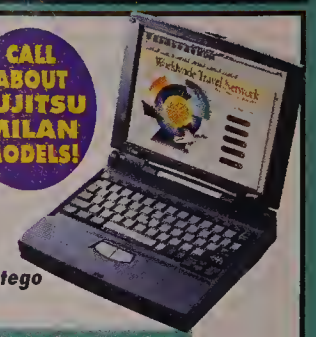

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Model	Processor	Screen	RAM/HD	Price
MONTEGO	Pentium 100	10.4" Active	8MB/1GB	$2999

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Model	Processor	Screen	RAM/HD	Price
3030	Pentium 100	11.3" Dual Scan	8/515MB	$1749
3070	Pentium 100	11.3" Dual Scan	16MB/1GB	2249
9000	Pentium 100	11.3" Dual Scan	8MB/1GB	2449†

Model	Processor	Screen	RAM/HD	Price
3040	Pentium 100	12.1" Dual Scan	8MB/1.1GB	$2199
9030	Pentium 120	11.3" Active (SHA)	8MB/1.1GB	2949
9020	Pentium 120	12.1" Dual Scan	16MB/1.1GB	2999†
9050	Pentium 133	11.3" Active (SHA)	16MB/1.1GB	3699†
9070	Pentium 133	12.1" Active (SHA)	16MB/1GB	4199*
9080	Pentium 133	12.1" Active (SHA)	16MB/1.3GB	4999†

* Includes built-in 4X CD-ROM drive
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6000H	Pentium 100	12.1" Active	16MB/1.1GB	$3999
6030H	Pentium 133	12.1" Active	16MB/1.3GB	4999
6030X	Pentium 133	12.1" Active	16MB/1.4GB	5399

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Model	Processor	Screen	RAM/HD	Price
P40	Pentium 120	11.3" Active	16MB/1.0GB	$3499
P40	Pentium 120	11.3" Active	16MB/2.1GB	3999
P50	Pentium 133	12.1" Active	24MB/1.0GB	4499
P50	Pentium 133	12.1" Active	24MB/2.1GB	4999

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Model	Processor	Screen	RAM/HD	Price
J10	Pentium 75	10.4" Dual Scan	8/500MB	$1849
J20	Pentium 100	11.3" Dual Scan	8/810MB	1899
J10	Pentium 75	10.4" Dual Scan	8/800MB	2049
J30	Pentium 100	10.4" Dual Scan	8/800MB	2199
J30	Pentium 100	10.4" Active Matrix	8/800MB	2499
J50	Pentium 133	10.4" Active Matrix	8/800MB	2899

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odel	Processor	Screen	RAM/HD	Price
20	Pentium 120	11.3" Active	8MB/1.08GB	$4099
30	Pentium 133	12.1" Active	16MB/1.35GB	4889
50	Pentium 150	12.1" Active	16MB/1.35GB	5379

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C23	Pentium 120	16MB/1.6GB	8X	$1969
C33	Pentium 133	16MB/1.6GB	BX	1999
C65	Pentium 166	16MB/2.0GB	BX	2449
C73	Pentium 200	16MB/2.5GB	BX	2899
C77	Pentium 200	32MB/3.2GB	BX	3299

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- Video conferencing & tuner card on 9312 model

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9312	Pentium 166	24MB/2.5GB	BX	2599
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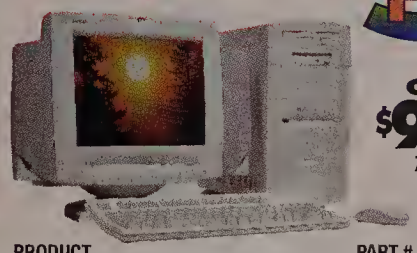

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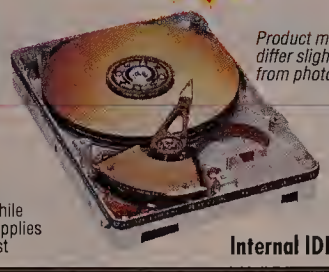

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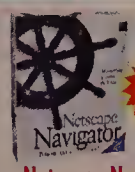

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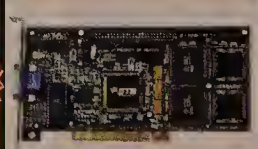

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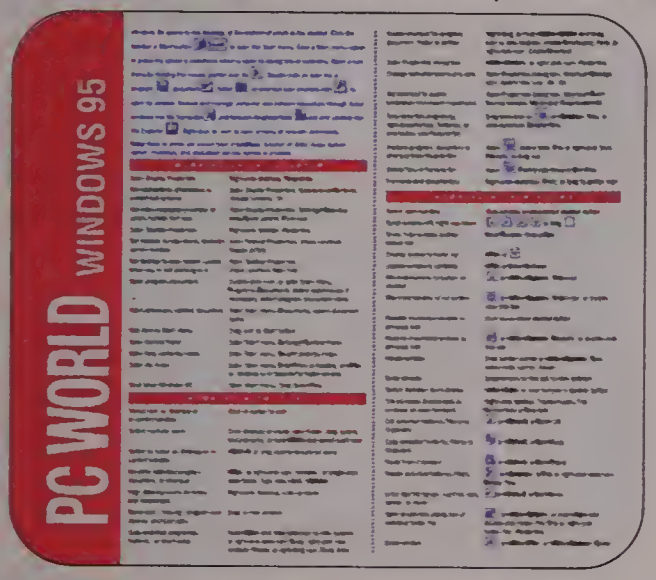

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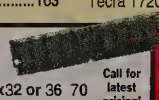

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Tecra 700, 710, 720 (SDRAM)	***8Meg/16Meg/32Meg***		***149/289/599***
Tecra 700, 710, 720	***810Meg/1.3Gig***		***729/819***
T2000SXE/2200SX/T1800, 1850, C	2Meg/4Meg/8Meg	PC-PA2000U	59/89/119
T2100, 2105, 2150, 2155, 2110, 2115	4Meg/8Meg/16Meg/24 Meg		69/109/189/249
T4500, C, T4600, T4700, T1900, C, T1910, T1950 (3.3 v)	4Meg	PC-PA2012U	69.00
T4500, C, T4600, T4700, T1900, C, T1910, T1950 (3.3 v)	8Meg	PC-PA2013U	109.00
T4500, C, T4600, T4700, T1900, C, T1910, T1950 (3.3 v)	16Meg/32Meg	PC-PA2014U	199/349
T3400CT, T2400, T3600	4Meg/8Meg/16Meg	PC-PA2019U	89/119/179
T600, 610, CT Edo	8Meg/16Meg/32Meg		119/189/319
T400CS, 400CDT, T100, 105 Edo	***8Meg/16Meg/32Meg***		***119/189/319***

NOTEBOOK, LAPTOP MEMORY

MODEL	AMT. UPGRADED	MANU. PART #	PRICE
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ACER 763, 765, 782, 784, 786, 787,	4Meg/8Meg/16Meg		69/109/199
ACER 750	4Meg/8Meg/16Meg		69/109/199
ACER Note Pro, ACER Note Lite, 350, 355	***4Meg/8Meg/16Meg***		***59/99/179***
ARM TS38	4Meg/8Meg/16Meg		69/109/219
AST Ascentia P30, P50	***8Meg/16Meg/32Meg***		***Call***
AST Ascentia J10, J30, J50	***8Meg/16Meg/32Meg/40Meg Kit***		***99/189/Call/Call***
AST Ascentia 900N, 800N, 810, 910	4Meg/8Meg/16Meg		79/129/219
AST Ascentia 950	8Meg/16Meg		99/189
AST Bravo & Explorer	***4Meg/16Meg***	***501255-001, -002***	***79/219***
AST Notebook Prem Exec 386SX/20/25/25L	4Meg	500814-003	69.00
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AT&T Globalyst 130, 200, 250	4Meg/8Meg/16Meg		79/119/219
Austin OX4, OX2, SX2, SX Series	4Meg/16Meg		79/219
Austin Vista	***4Meg/8Meg/16Meg/20Meg***		***Call***
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Canon Innova 8ook 200LS	4Meg/8Meg/16Meg/24Meg		69/99/219/349
Canon Innova 8ook 350CD, 360, 475	***8Meg/16Meg***		***109/189***
Canon Innova 486-10	4Meg/16Meg		79/219
Compuadd 450ns, 475ns	4Meg/16Meg		79/219
CTX EZ 8ook 5x86 Pent, Series	***4Meg/8Meg/16Meg***		***Call***
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Epson ActionNote 700, 700c, 700cx	4Meg/16Meg		79/189
Epson ActionNote 880, 866c, 890	4Meg/8Meg/16Meg/20Meg		69/109/169/299
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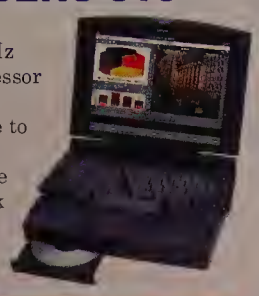

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Quark QuarkXPress V3.32 WIN	574.86
Softkey Calendar Creator Plus V2.0 WIN	37.10
Symantec ACT! Mobile Link V2.0 WIN	236.73
Symantec ACT! V2.0 WIN	171.24
Symantec Norton AntiVirus V3.0 DOS/WIN	49.20
Symantec Norton NT Tools V1.0 WIN NT CD	45.00
Symantec Norton Utilities V8.0 DOS/WIN	112.53
Symantec pcANYWHERE V2.0 WIN	119.21
Symantec pcANYWHERE V2.0 WIN host	61.78
Symantec pcANYWHERE V2.0 WIN remote	79.44
Symantec pcANYWHERE V5.0 DOS	121.17
Symantec WinFAX PRO V4.0 WIN	78.14
Ventana Netscape Navigator V2.0 WIN	43.04
Visio V4.0 WIN 3.5/CD	132.88
Visio V4.0 WIN upg	72.81
Walker Reflections 1 V5.0 WIN	283.28

WINDOWS® 95 SOFTWARE

Arcada Backup for Windows 95	56.90
Borland Delphi Developer V2.0 WIN95/NT upg	237.14
Caere OmniForm V2.0 WIN95	171.13
Caere OmniPage Pro V7.0 WIN95 vers upg	113.65
Claris FileMaker Pro V3.0 WIN95/WIN/NT upg	93.52
Claris FileMaker Pro V3.0 WIN95/WIN/NT CD	181.25
Corel Graphics Pack WIN95 CD	92.00
Corel WordPerfect Suite V7.0 WIN95 CD	241.34
Corel WordPerfect Suite V7.0 WIN95 upg 3.5/CD	133.70
Corel WordPerfect Suite V7.0 WIN95 upg CD	93.15
CorelDRAW! V3.0 or V4.0 to V6.0 WIN95 upg CD	354.02
CorelDRAW! V5.0 to V6.0 WIN95 upg CD	183.47
CorelDRAW! V6.0 WIN95 CD	438.37
Datastorm Procomm Plus V3.0 WIN95/WIN	122.77
Datastorm Procomm Plus V3.0 WIN95/WIN CD	123.55
Datastorm Procomm Plus V3.0 WIN95/WIN upg	68.09
Delrina CommSuite WIN95 CD	95.41
Delrina WinFAX PRO V7.0 WIN95	77.35
Delrina WinFAX PRO V7.0 WIN95 CD	76.84
Helix Hurricane V2.0 WIN95/WIN	42.99
Lotus Organizer 97 WIN95 CD	71.63
Lotus Organizer V2.1 WIN95	71.63
Lotus SmartSuite 96 WIN95 upg	138.72
Lotus SmartSuite 96 WIN95 upg CD	138.72
McAfee VirusScan V2.0 WIN95	44.23
Microcom Carbon Copy V3.0 WIN95	85.18
Microsoft Access V7.0 WIN95	296.94
Microsoft Access V7.0 WIN95 dev kit	442.38
Microsoft Access V7.0 WIN95 upg	94.05
Microsoft Bookshelf WIN95 CD	44.94
Microsoft Encarta '96 World Atlas WIN95 CD	44.94
Microsoft FrontPage V1.1 WIN95	137.34
Microsoft Office Professional w/Access WIN95 upg	314.50
Microsoft Office Professional WIN95	539.03
Microsoft Office Professional WIN95 CD w/Bkshelf	539.03
Microsoft Office Professional WIN95 upg CD w/Bkshelf	314.29
Microsoft Office Std WIN95	456.06
Microsoft Office Std WIN95 CD	461.57
Microsoft Office Std WIN95 upg	223.97
Microsoft Office Std WIN95 upg CD	229.31
Microsoft Plus! WIN95	44.84
Microsoft Plus! WIN95 CD	45.13
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Microsoft Publisher CD Deluxe WIN95	69.29
Microsoft Small Business Financial Mgr WIN95	86.76
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MS Visual Basic Pro V4.0 WIN95/WIN/NT comp upg CD	219.18
MS Visual Basic Pro V4.0 WIN95/WIN/NT vers upg CD	86.33
Microsoft Visual Basic Std V4.0 WIN95/WIN/NT CD	86.38
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Microsoft Visual C++ Subscription WIN95 upg CD	313.28
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Microsoft Windows 95 upg	94.77
Microsoft Windows 95 upg CD	94.77
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Microsoft Works WIN95	45.13
Quarterdeck Clean Sweep V2.0 WIN95	28.85
Quarterdeck OEMM V8.0 WIN95/WIN	62.16
Symantec Norton AntiVirus V2.0 WIN95	65.88
Symantec Norton AntiVirus WIN95	72.14
Symantec Norton AntiVirus WIN95 trade-up	33.75
Symantec Norton Navigator WIN95 CD	91.80
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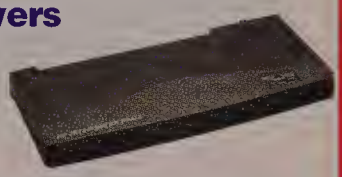
90MHz	150MHz	$319.20	65940
100MHz	166MHz	$456.23	65943

[1]Call to verify your system compatibility

HEWLETT® PACKARD HP JetDirect EX Plus3 Print Servers



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5100	100MHz Pentium	16MB	2.1GB	$1543.36	66977
5133	133MHz Pentium	16MB	1.2GB	$1554.43	66979
5133	133MHz Pentium	16MB	2.1GB	$1707.60	66980

AST Bravo MS desktop computers

Model	CPU	RAM	Hard Drive	CD-ROM	Price	CDW
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5100	100MHz Pentium	16MB	2.1GB	–	$1488.05	66968
5133	133MHz Pentium	16MB	1.2GB	–	$1499.11	66970
5133	133MHz Pentium	16MB	2.1GB	–	$1609.74	66971
5166	166MHz Pentium	16MB	2.1GB	6X	$2052.28	66973

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■ 100MHz, 120MHz or 133MHz Intel Pentium processors ■ 8MB RAM ■ 850MB or 1.28GB hard drives ■ Selected models include 28.8K bps data/fax modems and CD-ROM drives ■ Windows® 95 ■ Pre-installed software: ClarisWorks; Lotus Organizer; Adobe Acrobat and more!

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■ Intel® Pentium® processors ■ RAM: 16MB standard, 128MB maximum ■ 1.28GB or 1.62GB EIDE hard drive ■ 6X CD-ROM drive ■ S3 Trio64 graphics with 1MB DRAM standard, 2MB maximum ■ 28.8K bps data/fax modem with answering machine and speakerphone (515CCx, 515MCx) ■ Pre-installed Windows® 95 ■ **Pre-installed software: Microsoft® Office Professional with Bookshelf; Microsoft Publisher; Microsoft Plus! Companion for Windows 95; HP Discover; HP Help; HP Printer Ready; Microcom Carbon Copy Host for HP Remote Support; Cheyenne BitWare (515CCx, 515MCx)** ■ 1-year on-site warranty

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Hewlett Packard Vectra 500 Series PCs

Desktop	CPU	RAM	Hard Drive	CD-ROM	Price	CDW
510CD	120MHz Pentium	16MB	1.28GB	6X	$1616.99	72888
Mini-tower	**CPU**	**RAM**	**Hard Drive**	**CD-ROM**	**Price**	**CDW**
515CCx	120MHz Pentium	16MB	1.28GB	6X	$1819.45	72890
515CD	133MHz Pentium	16MB	1.62GB	6X	$1828.75	72891
515MCx	133MHz Pentium	16MB	1.62GB	6X	$2064.29	72892
515MCx	150MHz Pentium	16MB	1.62GB	6X	$2174.31	72893
515MCx	166MHz Pentium	16MB	1.62GB	6X	$2353.19	72894

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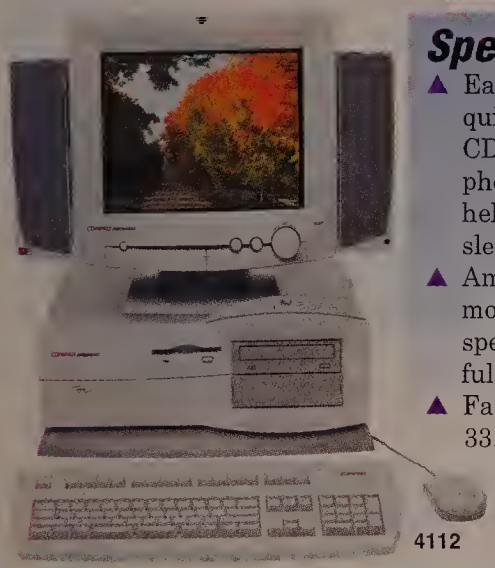

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- Amazing sight, sound and motion with JBL Pro speakers and full-motion MPEG support
- Fast online access with a 33.6K bps data/fax modem

Monitor sold separately

4112

Desktop	CPU	RAM	Hard Drive	CD-ROM Drive	Price	CDW
4112	120MHz Pentium	16MB	1.6GB	6X	$1499.00	73385
4122	150MHz Pentium	16MB	2.5GB	8X	$1899.00	73386
Mini-tower	**CPU**	**RAM**	**Hard Drive**	**CD-ROM Drive**	**Price**	**CDW**
4704	133MHz Pentium	16MB	1.6GB	6X	$1699.00	73389
6704	166MHz Pentium	24MB	2.5GB	8X	$2399.00	73392

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▲ 120MHz (7232) or 133MHz (7240) Intel® Pentium® processor ▲ 8MB EDO RAM standard, 128MB maximum ▲ 1.6GB hard drive ▲ 4X (7232) or 6X (7240) CD-ROM drive ▲ 28.8K bps data/fax modem with full-duplex speakerphone ▲ Scanner keyboard with Windows 95 keys (7232 only) ▲ Software: Microsoft® Windows 95 and more! ▲ 3-year limited warranty

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Presario 7240 **$1399.00** CDW 72137

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Aptiva C33 ..... **$1999.00** CDW 73083

Aptiva C65 ..... **$2449.00** CDW 73084

Aptiva C73 ..... **$2899.00** CDW 73085

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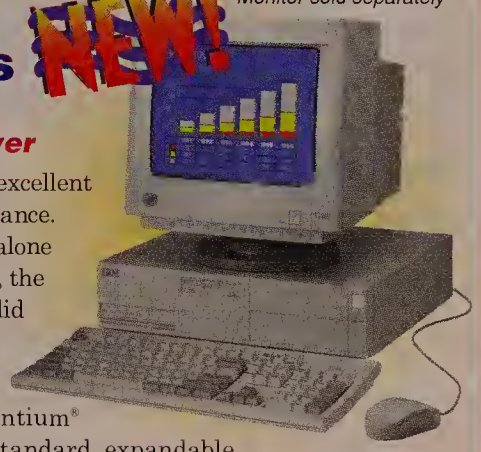

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PC 340 100MHz Pentium ..... **$1389.16** CDW 71857

PC 340 133MHz Pentium ..... **$1618.87** CDW 71858

PC 340 ..... **$1139.29** CDW 71856

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◆ 100MHz Intel Pentium® processor ◆ 8MB EDO RAM standard, expandable to 40MB ◆ 1.2GB hard disk drive ◆ 1.44MB, 3.5" floppy disk drive ◆ 10.4" TFT active-matrix color display ◆ 4.8 lbs.

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500CDT **$4519.30** CDW 70243

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$4339.19 CDW 70244

Tecra 730CDT

◆ 150MHz Intel Pentium® processor ◆ 16MB EDO RAM standard, expandable to 144MB ◆ 2GB removable hard drive, 3.5" 1.44MB floppy drive ◆ 6X CD-ROM drive ◆ 12.1" TFT active-matrix color display ◆ Integrated 28.8K bps (V.34) modem

$6002.37 CDW 73155

Tecra 720CDT

◆ 133MHz Intel Pentium® processor ◆ 16MB RAM ◆ 1.2GB hard drive

$5289.11 CDW 66319

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16MB RAM upgrade	$229.98/71633	$271.61/61422	$569.21/57173	$569.21/57173	$229.98/71633	$569.21/57173
32MB RAM upgrade	$419.90/71634	$506.10/65436	$671.98/56792	$671.98/56792	—	$671.98/56792
AC adapter	—	$116.48/62056	—	$69.86/56400	$69.86/56400	—
Lithium Ion battery pack	$221.86/71637	$248.02/62025	—	$229.03/56414	$223.53/71675	$197.80/57484
NiMH battery pack	—	—	$223.13/62734	—	—	—
Battery pack recharger	$275.04/71638	$329.25/62357	$145.26/52122	$265.89/33641	$299.97/71676	$284.00/58012
Desk Station V Plus	$829.12/68691	$829.12/68691	—	—	$829.12/68691	—
NoteDock Enhanced Port Replicator	—	—	$343.68/64604	—	—	$343.68/64604
NoteDock II Enhanced Port Replicator	$531.88/69168	$531.88/69168	—	—	$531.88/69168	—

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Model	CPU	RAM	Hard Drive	CD-ROM	Price	CDW
P30 CSS11	100MHz	8MB	1.2GB	4X	$2596.09	65839
P40 CTS11	120MHz	16MB	1GB	6X	$3287.93	73028
P40 CTS11	120MHz	16MB	2.1GB	6X	$3749.59	73029
P50 CTS12	133MHz	24MB	1GB	6X	$4217.73	73030
P50 CTS12	133MHz	24MB	2.1GB	6X	$4676.95	73032

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✔ 10.4" active-matrix display

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Armada 1100

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1120T **$2208.02** CDW 71111

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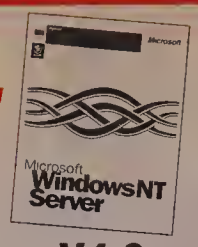

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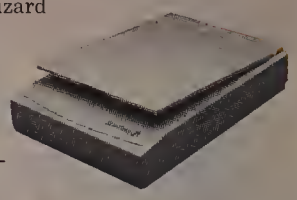

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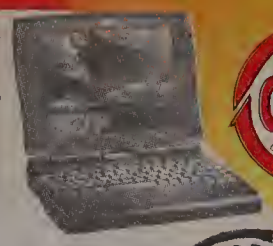

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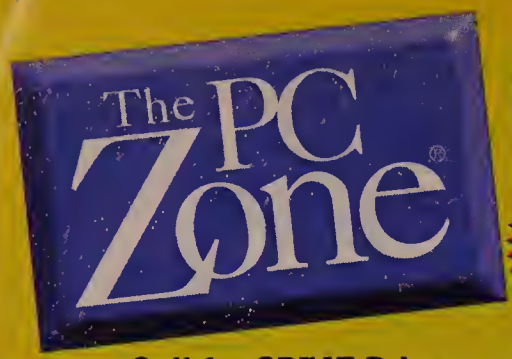

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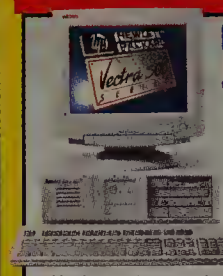

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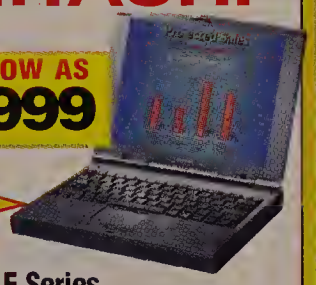

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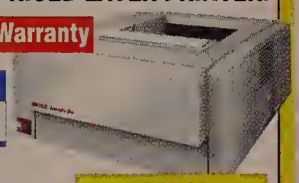

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19449	Sportster V.34 28.8 Ext Fax/Mod for Win	$199.98
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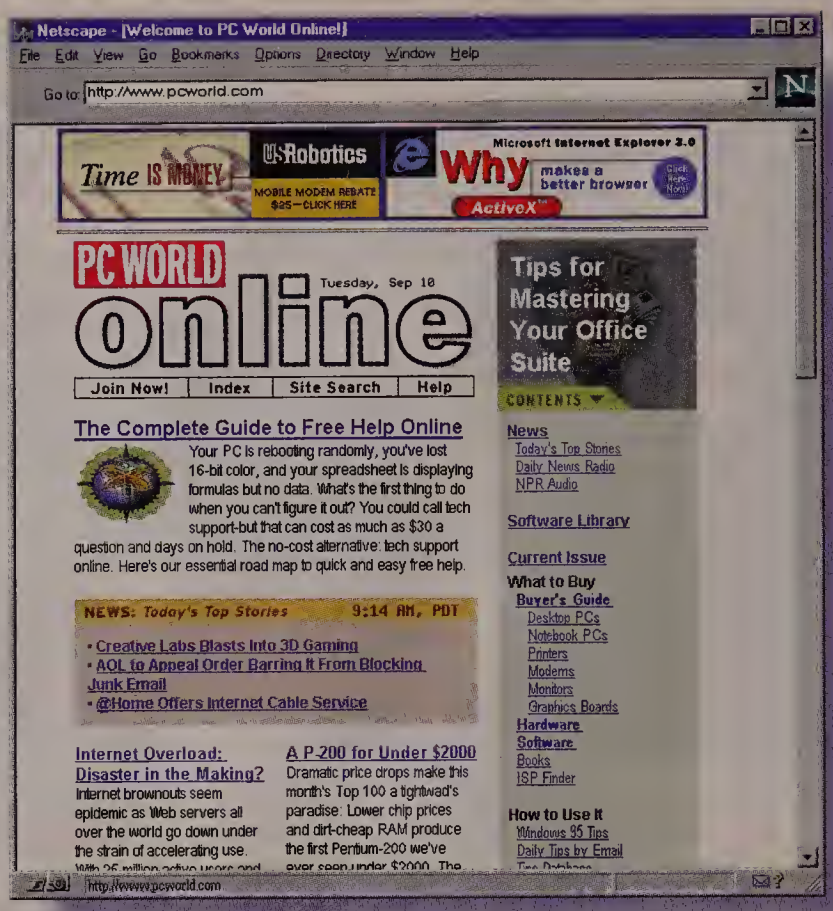

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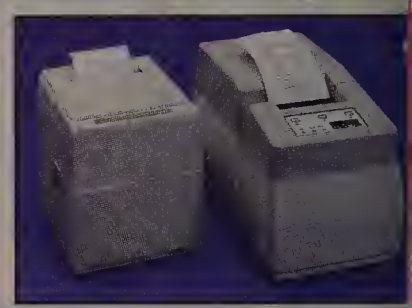

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Deskpro XL Series, Desktops, 16MB 197
Deskpro XL Series, Desktops, 32MB 312
Deskpro XL6/50, Desktops, 16MB 273
Deskpro XL6/50, Desktops, 32MB 333
Proliant 1500/1500R/133 Servers, 16MB.....190
Proliant 1500/1500R/133 Servers, 32MB.....318
Presario Series, Desktops, 8MB.....58
Presario Series, Desktops, 16MB 118
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Vectra VL4 Series, Desktops, 32MB 388
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Vectra XU/VT 6150, MT, 32MB 338
Vectra Net server LC, Servers, 8MB 81
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Aptiva M40/M41 Desktops, 8MB 60
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Aptiva M40/M41 Desktops, 32MB 231
PS/1 Value Point, Desktops, 4MB 43
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PC 300/700, Desktops/MT, 8MB 95
PC 300/700, Desktops/MT, 16MB 173
PC 300/700, Desktops/MT, 32MB 267
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IBM

Thinkpad 365C Series, 4MB /16MB.....381/162
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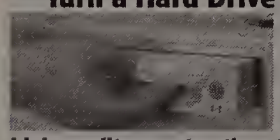

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SCSI	**$85**	**$40**	**$54**
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230MB	Fujitsu IDE	$339
230MB	Smart Storage Solutions SCSI	$339
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640MB	Fujitsu (230MB backwards compatible)	$555
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1.3Gig	Maxoptix	$1039
2.6Gig	Smart Storage Solutions	$1649
2.6Gig	Maxoptix	$1789
2.6Gig	Hewlett Packard	$2219
52Gig	Maxoptix (does not include free disks)	$4549

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Yamaha	2X Write 4X Read	$550
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Smart & Friendly	2X Write 4X Read	$Call
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• CD ROM DRIVES •

Brand	Spin	Model	Speed	Int	Ext
SCSI					
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Plextor	4.5X	PX43CE	130ms	$230	$320
Teac	6X	CD56S	160ms	$155	$245
Plextor	6X	PX63CS	145ms	$269	$359
Philips	8X	PC80S	195ms	$225	$315
NEC	8X	CDR1410	145ms	$219	$309
Plextor	8X	PX83CS	115ms	$339	$429
Pioneer	10X	DRA10X	140ms	$239	$329
ATAPI IDE				**Int**	**Int kit**
OEM	4X	IDECD4X	200ms	$65	$80
NEC	6X	CDR1300	145ms	$79	$94
Acer	8X	AC885A	190ms	$99	$114
Mitsumi	8X	CRMCFXB00	150ms	$120	$135
Teac	8X	CD58E	110ms	$115	$130
Toshiba	8X	XM5602B	145ms	$115	$130
NEC	8X	CDR1400	140ms	$150	$165
Pioneer	10X	DRA10X	140ms	$199	$214

CD ROM CHANGERS

Internal IDE					
Torisan	4X	CDR3X4	3Disk	230ms	$89
NEC	4X	CDR4X4	4Disk	250ms	$99
Internal SCSI					
Nakamichi	8X	MJ48S	4Disk	150ms	$549
				External	$599
External SCSI					
Pioneer	4.4X	DRM-624X	6 Disk	190ms	$359

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Capacity	Brand & Model	Price
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4-BGB	Seagate TSTB000	$399
	• 4mm DAT DRIVES •	
2GB	Hewlett Packard C1534	$609
2-4GB	Seagate C4324RP	$679
2-4GB	Hewlett Packard C1536	$699
4-BGB	Sony SDT5000	$B09
4-BGB	Seagate C4326NP (DDS2)	$B59
4-BGB	Hewlett Packard C1533A	$999
4-BGB	Sony SDT7000 TURBO SPEED!	$909
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4B-96GB	Seagate C4586NP 12 tape autoloader	$2399
	• 8mm DAT DRIVES •	
3.5-7GB	ExaByte EXBB205XL	$1269
7-14GB	ExaByte EXBB505XL	$1BB9
7-14GB	ExaByte EXBB700LT	$1149
20-40GB	ExaByte EXBB900	$5499
70-140GB	ExaByte EXB10H 10 tape autoloader	$5439
	• DLT DRIVES •	
15-30GB	Quantum DLT2000	$2499

• QIC •

800MB	$141
1GB	$159
1.7GB	$219
3.2GB	$249
4.4GB	$259
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800MB	$259
1Gig	$269
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540MB	14ms	44B0	Maxtor	M7541A	3	$159
639MB	10ms	4500	Western Digital	AC2635	3	$160
B50MB	10ms	4500	Western Digital	AC2B50	3	$165
B50MB	14ms	3600	Seagate	ST3B51A	3	$171
1080MB	**11ms**	**4500**	**Fujitsu**	**M1614T**	**3**	**$165**
10B4MB	14ms	44B0	Maxtor	M710B4A	2	$1B5
1250MB	15ms	3600	Quantum	BF1250A	3	$175
1270MB	10.5ms	5400	Seagate	ST51270A	3	$1B7
12B0MB	12ms	5400	Quantum	FB12B0A	3	$19B
12B1MB	11ms	5200	Western Digital	AC21200A	3	$192
1336MB	11ms	44B0	Maxtor	M71336A	3	$190
1620MB	14ms	3600	Seagate	ST31621A	3	$212
1624MB	10ms	5200	Western Digital	AC31600	3	$225
1625MB	10.5ms	5400	Seagate	ST31640A	3	$22B
1626MB	11ms	44B0	Maxtor	M71626AP	3	$220
1700MB	11ms	4500	Quantum	SR31700A	3	$21B
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2550MB	11ms	4500	Quantum	SR32550A	3	$299
2559MB	11ms	5200	Western Digital	AC32500	3	$319
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2 1/2"						
540MB	13ms	4200	Toshiba	MK1924FC	1	$229
B10MB	13ms	4200	Toshiba	MK1926FC	1	$329
1350MB	13ms	4200	Toshiba	MK2720FC	1	$519
2100MB	13ms	4200	Toshiba	MK2101MAN	1	$699

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SCSI	Speed	RPM	Brand	Model	Wty	Int	Ext
1050MB	9ms	5400	Seagate	ST31055N	3	$339	$399
1080MB	12.5ms	5400	Seagate	ST51080N	3	$259	$319
2147M8	9ms	5400	Seagate	ST32155N	5	$499	$559
2147MB	8ms	7200	Seagate	ST32550N	5	$729	$789
2150MB	8.5ms	7200	Quantum	XP32150	5	$639	$699
4290M8	8ms	7200	Seagate	ST15230N	5	$889	$949
4290MB	8ms	7200	Seagate	ST15150N	5	$Call	$Call
4300M8	8.6ms	7200	Quantum	XP34300	5	$900	$960
9080MB	11ms	5400	Seagate	ST410800N	5	$1749	$1849
WIDE SCSI							
1070M8	8ms	7200	Quantum	XP31070W	5	$299	$429
2147MB	8ms	7200	Seagate	ST32550W	5	$789	$919
2150MB	9ms	5400	Seagate	ST32155W	5	$559	$689
2150M8	8.5ms	7200	Quantum	XP32150W	5	$649	$779
4294MB	8ms	7200	Seagate	ST15150W	5	$Call	$Call
4300MB	8.6ms	7200	Quantum	XP34300W	5	$919	$1049
9100MB	11ms	5400	Seagate	ST410800W	5	$2029	$2219
WIDE DIFFERENTIAL SCSI							
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4294MB	8ms	7200	Micropolis	MC3243WD	5	$899	$1029
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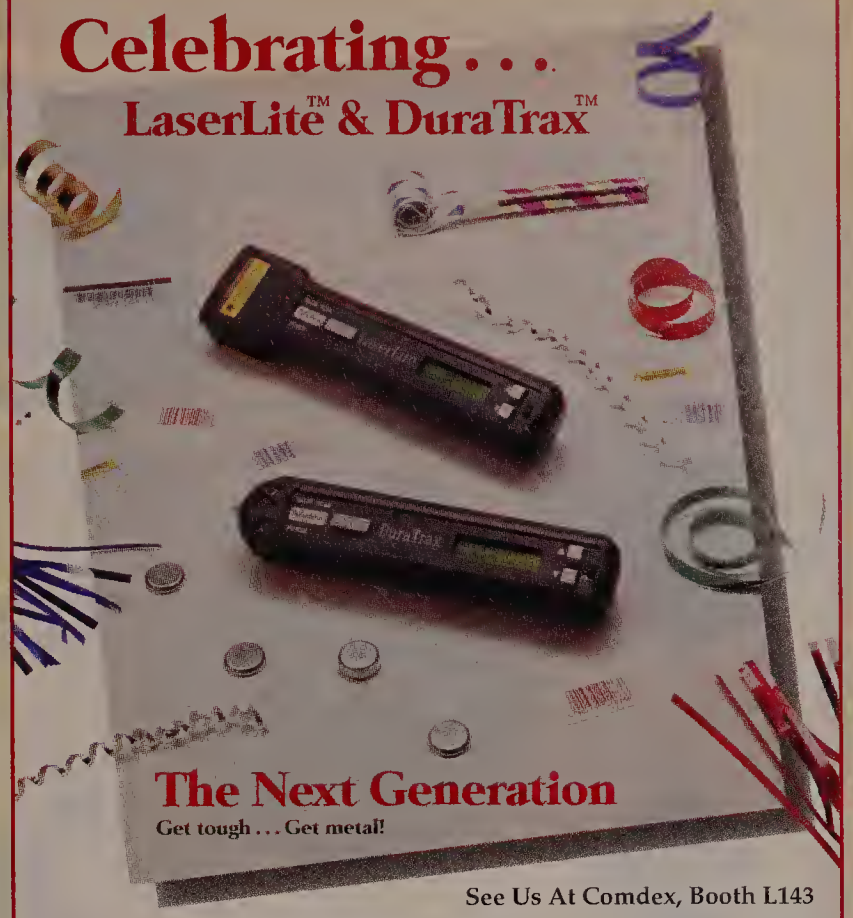

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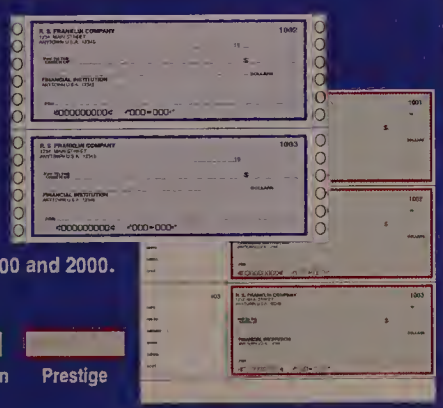

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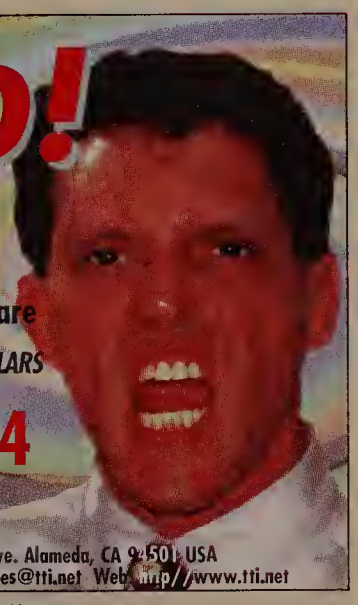

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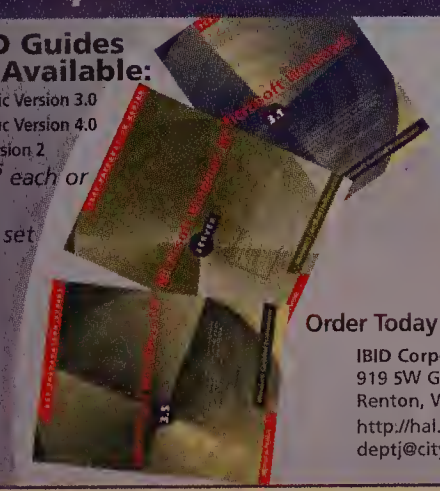

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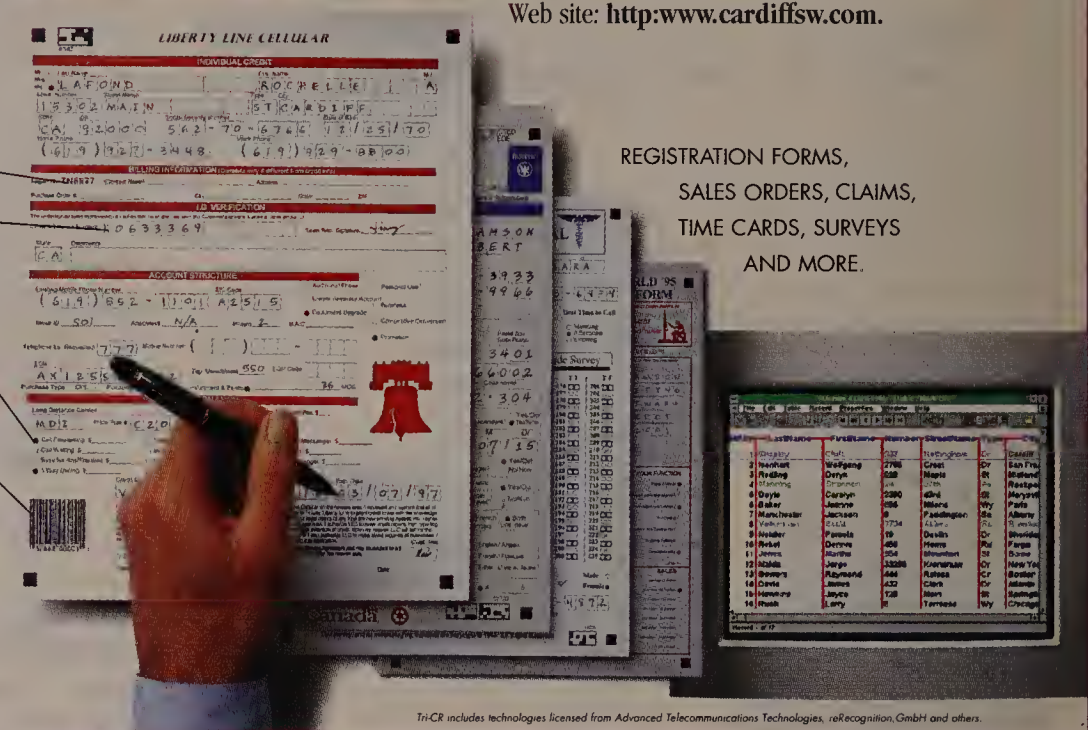

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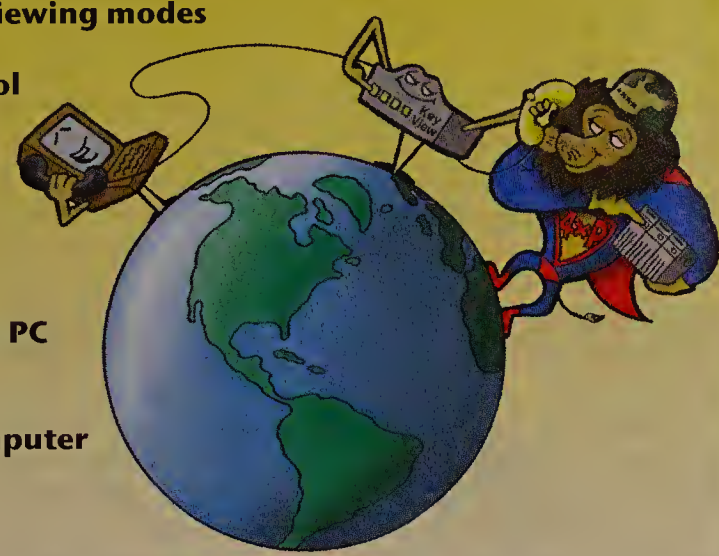

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CAD Suite Advantages

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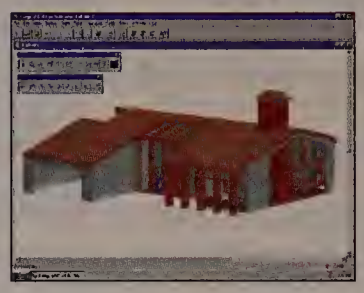
by Tom King.

Want to design your dream home, edit an existing house plan, or hash out a few creative changes on a CAD drawing? Can't afford the expensive software, or would like to start your own design/drafting business? Want dependable software and tools that really work together? Hint: think suite.

The advantages of suites hinges on the extra utilities or other features that make the main programs more productive. A single purchase provides this, plus the ability to correspond with a single software company if support is needed.

Caution! Creating with CAD will strip the very threads of your wallet ... unless you shop around.

The trend moving away from pricey, cumbersome programs, like AutoCAD, has apparently caught on. Take, for instance, a recent CAD suite from ViaGrafix: DesignCAD Office. This suite offers a full featured CAD system for under a thousand dollars. Say what???



Here's what they give you: DesignCAD 2D and DesignCAD 3D for Windows 95 software (two completely separate programs), cost estimation software, a scanning package, two video tutorials, and thousands of ready-to-use 2D and 3D professional symbols.

Anything helping to save time and boost productivity must be a good deal, right? Be careful, even though there are several combo-packages available, it might be advisable to get references or read the testimonials of actual users.

So, besides my own testimonial, try this one on for size. "I use DesignCAD for my drafting students because it's much easier to learn than AutoCAD," said Bill Stone, technology instructor at Junction City High, Junction City, KS.

The extra tools in DesignCAD Office 95 include: Professional 2D and 3D symbol libraries (with thousands of premade symbols), a cost estimation program (Instant Estimator), a program used to convert scanned files into CAD drawings (ScanPro), and two complete video tutorials for DesignCAD 2D and 3D. Yes, they even give you manuals and user guides and free technical support. Try it, you'll like it.

ViaGrafix can be reached on the web at viagrafix.com or give them a call at 800/233-3223.

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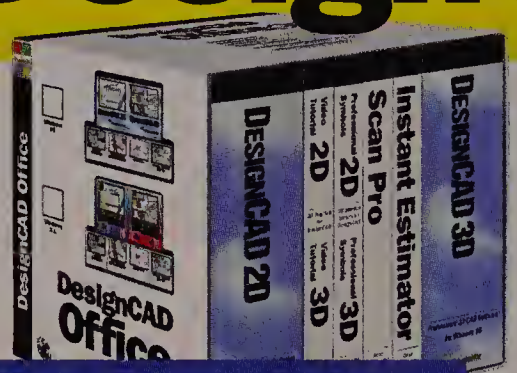
Tom King hosts the syndicated "CompuTalk – The World's Source For Geek-Free Computer Radio" heard nationwide. Tom is also a computer reporter for CBS's KHOU-TV in Houston, Texas.

DesignCAD Office 95



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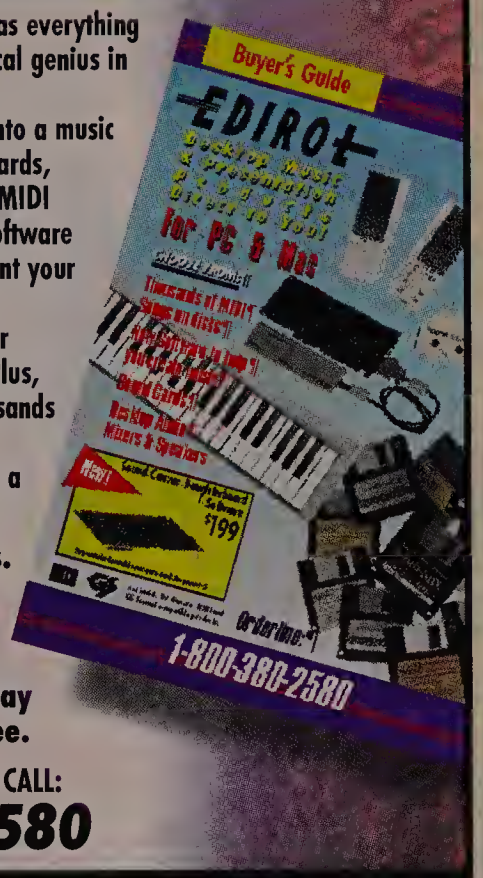

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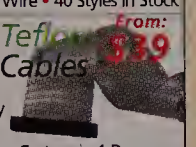

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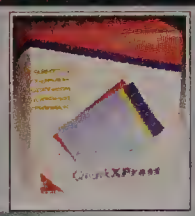

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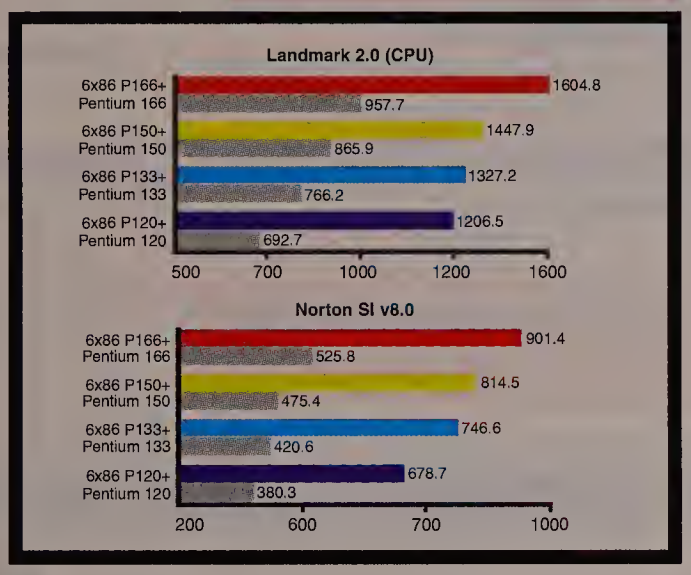

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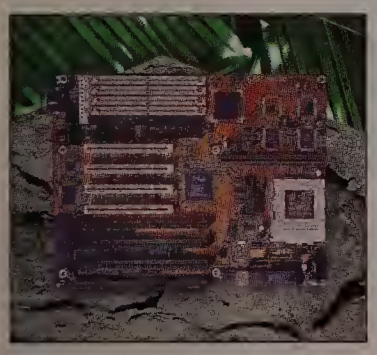

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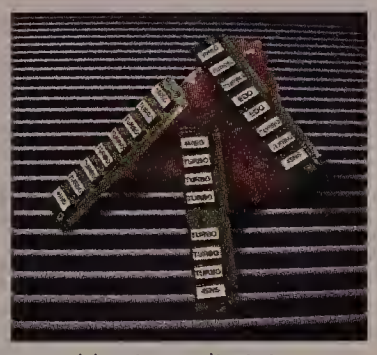

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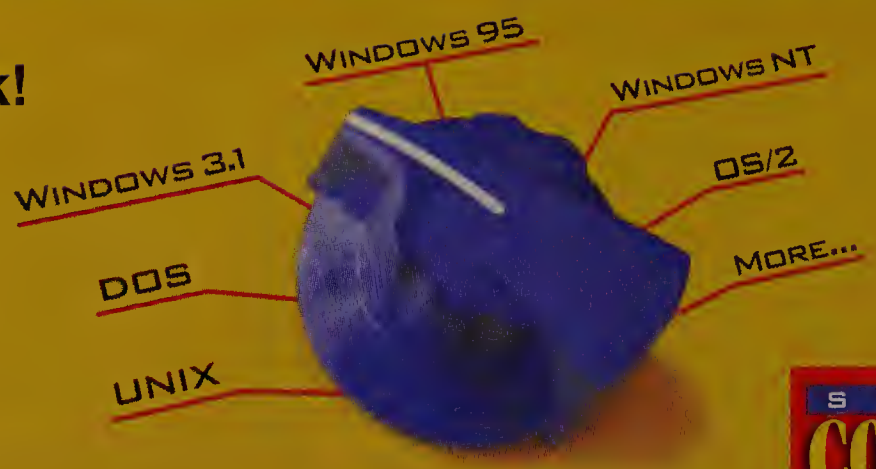

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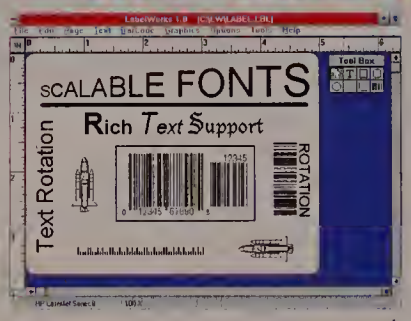

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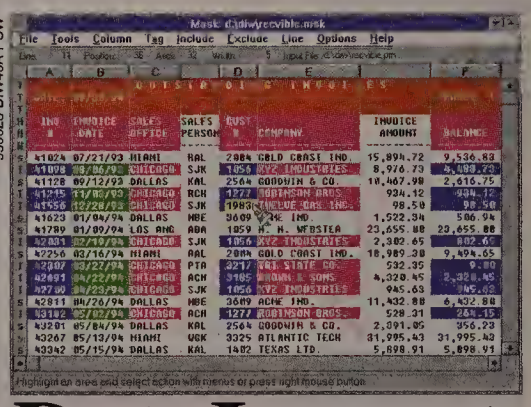

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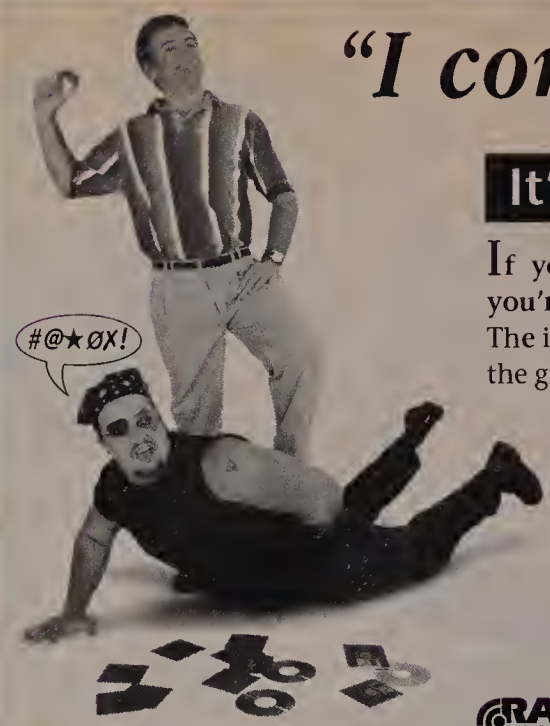

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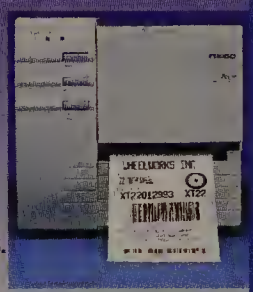

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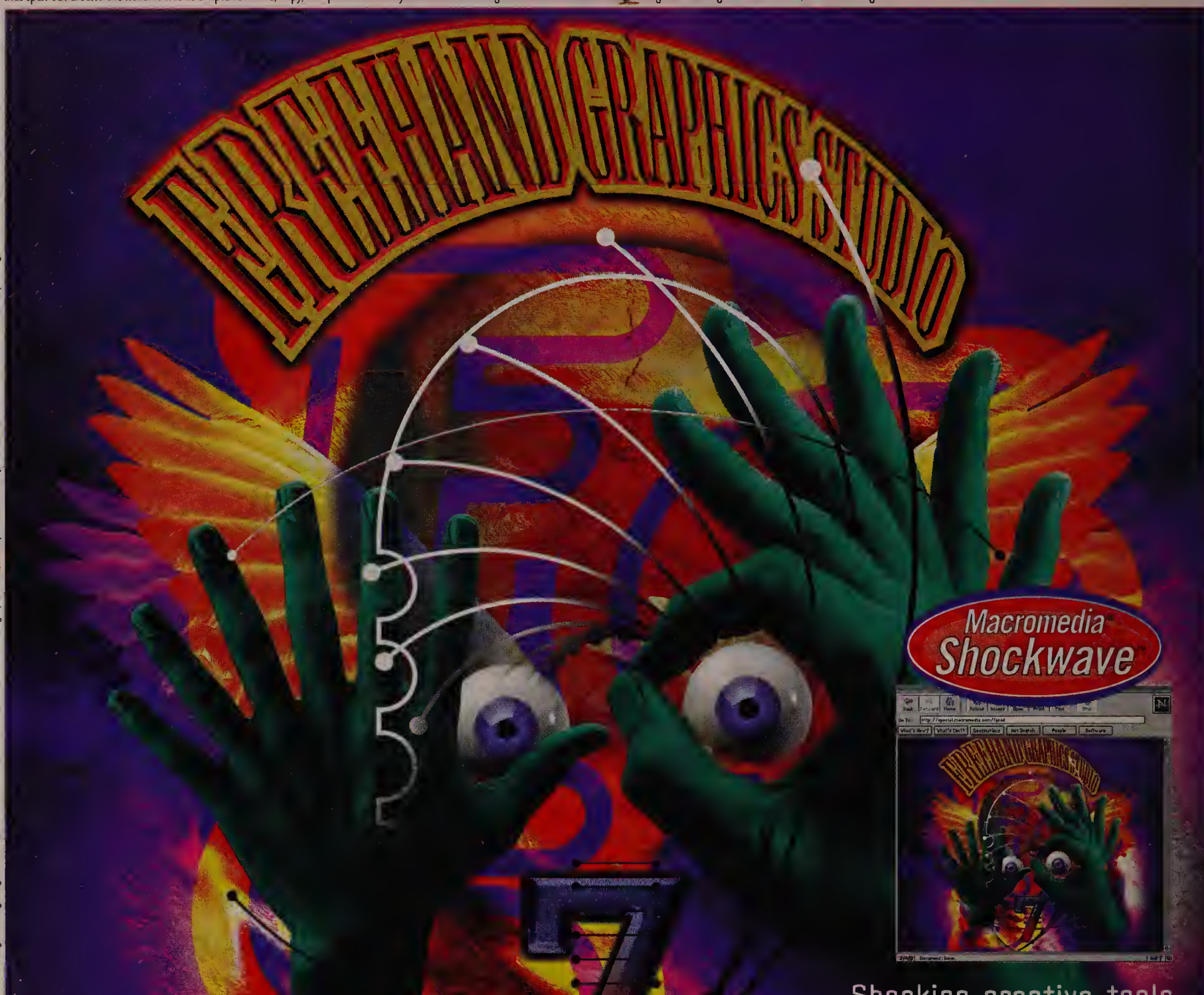
that span out around the head. It was as simple as rotate, copy, and paste. Then I layered the hi-res images in Macromedia xRes. To get seven fingers on the hands, I cloned a finger in xRes and extended it to look realistic. But I also wanted this image to be surreal, so I used Hue/Saturation to achieve the green effect. Extreme 3D came in handy to model the eyeballs and make them really pop. And voila! My self-portrait. Thanks for the great work, Usok. (And trust us, he's much better looking face to face.)



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README? Sure—Before I Buy!

IF YOU'RE IN THE MARKET for darkly fascinating computer-based information, README files are the place to look. Manuals rarely tell you much of anything anymore; it's in the READMEs that you discover the nasty little secrets manufacturers don't really want to reveal. And when subtle things go wrong, you can often find answers in the README file that you can't find anywhere else.

The README file gives you the lowdown on such things as tricky interrupt conflicts, incompatibilities, bugs you would never in a million years suspect existed, and outright caveats that never made it onto the outside of the package. Perusing a dozen README files in succession gives you a bracing dose of reality, not to mention strong evidence about which products are repeat offenders. Want to buy a new video card? Check out a bunch of multimedia programs' README files, and you'll quickly compile a mental list of which products to avoid.

README files contain the nasty information vendors don't really want to reveal.

Sometimes this stuff does find its way into the documentation, but most manuals nowadays are designed to emphasize the positive. Vendors seem to sense that the upbeat tone of their skinny "Get Creative With (Your Product Here)" booklets might be marred a bit if they included lines like 'If you have a Packard Bell machine and you receive the error 'Cannot Open File Handler' while in Windows 3.1, the problem is occurring because some of the QuickTime files are hidden and the 2.0.3 QuickTime installer can't replace them'. That example comes from the README for a kids' game; the parents probably ended up using the disc for target practice.

Windows 95 or no, multimedia programs are still notorious for just that sort of problem. Without the README, how likely would you be to guess the solution to what one kids' program calls 'Win95 video problems (such as incorrect color palettes or garbage being left on the screen)'? This is precisely what I got on my machine, and the README told me precisely what to do: 'Try turning off video acceleration. Open the 'System' control panel and choose the 'Performance' tab. Click the 'Graphics' button. Move the slider there down one step at a time until the problem goes away'. Amazingly, it worked!

Want real fun? Check out the many, many gotchas in the documentation for tape backup units and the programs that accompany them. As hardware devices become increasingly dependent on bundled software, they too provide their own README revelations. For example, Hewlett-Packard's ScanJet 4p comes with not one but two READMEs: one for its own software, and one for the bundled PaperPort software. README files have plenty of information I'd like to see *before* I plunk down my cash and commit time and effort to using the products.

In that light, then, a modest proposal: From now on, software and hardware makers should routinely post installation information, manuals, help files, and READMEs on their Web sites. That way, we users could sift through these essential facts before wasting a single moment buying, downloading, or installing the actual wares, hard or soft.

Plenty of product specs and advertisements are already available on the Web, as well as a few decent bug-list databases. But most vendors don't give you the real dirt. Even with software that's sold primarily online, finding out about possible problems up front is rarely easy.

Before I download that 2MB plug-in, I want to know exactly what's going to happen. How much disk space will it need, before and after I install it? Will it insist on putting its files in a particular directory, or do I get to pick? Is it likely to get indigestion from any of my hardware and software? Don't make me wait to find out until after I install the thing.

At first, vendors probably won't want to disclose this stuff, for fear it may make them look bad. It will: As PCs permeate the mass market, these maddening glitches become increasingly inexcusable. But vendors' only alternative is to spend more money on support, and still end up with dissatisfied customers.

So let's push to liberate real information. Let a thousand READMEs bloom!

Contributing Editor Stephen Manes is a columnist for the New York Times *and coauthor of* Gates: How Microsoft's Mogul Reinvented an Industry *(Touchstone/Simon & Schuster, 1994, 800/223-2348).* ■

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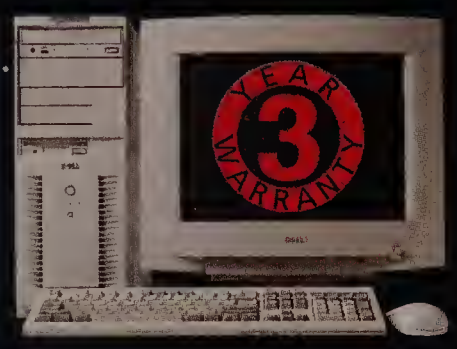

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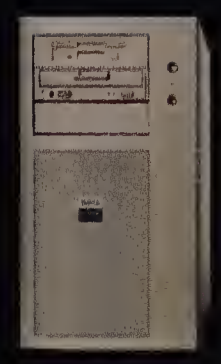

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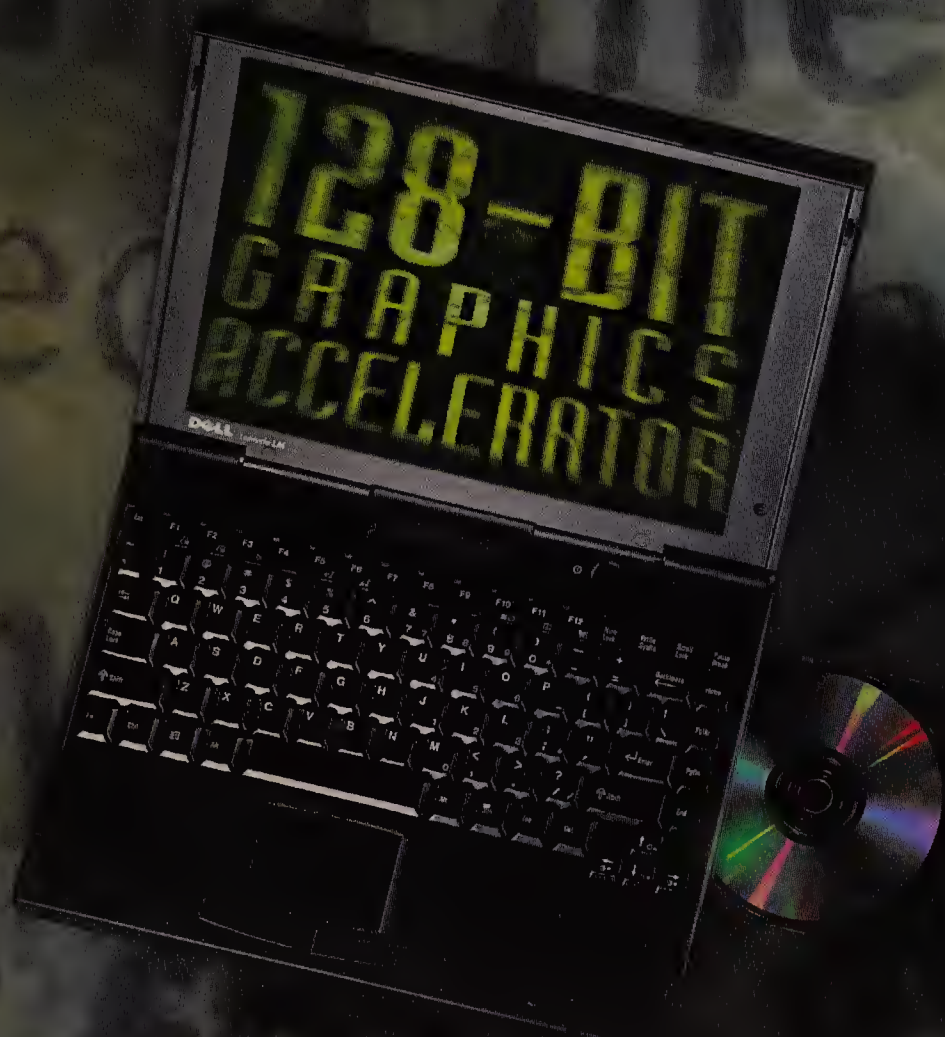

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